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and
The AIRCRAFT ENGINEER

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The Outlook

The Weight of Words

ONE sometimes wonders what effect the speeches of our Air Minister produce in the Dictators' countries. The Minister is naturally debarred from giving many definite figures, and is perforce thrown back upon somewhat intangible terms, perhaps meant to encourage the people of this country, perhaps to warn any possible enemies. Thus in his speech at Wellington, in Shropshire, last Saturday we read that Sir Kingsley spoke of the "remarkable development" of British aircraft, of provision for "substantial increases" in our programme, of "most satisfactory" recruiting, of "considerable expansion" in reserves and auxiliaries, of "great progress" in the R.A.F.V.R., and of the "considerable proportions" of the output of our aircraft industry.

It is doubtful whether this succession of imponderables may not be understood in quarters which are not too friendly to imply that the Air Minister thinks in his heart of hearts that our Air Force has not yet reached the stage where it could more than hold its own with any hostile force which it might have to meet. If that were the effect, more harm than good might be done by the words used. Foreign intelligence services are studying our doings, and they know the number of fighter squadrons which have to defend our coastline. The formation of new squadrons would certainly be more depressing to possible enemies and more cheering to ourselves than are the expressions which we have quoted.

Nevertheless, when the Air Minister says, as he did last Saturday, that an air attack on this country would be a highly dangerous and costly operation, he is striking the right note. Those who have studied our defences know that those words are true. They are, moreover, the sort of language which Dictators understand. Still better is it when the Air Minister feels that he can with safety quote figures. We are spending nearly two million pounds a week on aircraft alone. That is a statement to impress the world—all the more so when it is added that we still can butter our bread. Facts like that, when they can with prudence be made public, should certainly play their part in discouraging attacks upon the British Empire.

Strange Excitement

JUST recently, in American journals, very special attention has been given to the Douglas D.C.4, both during and after its coast-to-coast demonstration flight with United Air Lines. The attention was not directed to its undoubted aerodynamic and general qualities, but to the fact that it carries no fewer than forty-two passengers and has four engines.

From headlines such as "41-Passenger 4-Engined D.C.4 Wows Public in Eastern Debut," through more stolid descriptive matter about the way in which visitors gasped at the sheer number of occupants, to statements that the public will eventually demand four engines in commercial machines, the excitement grows. America has set a new standard in air transportation; nothing like it has been seen before; prospective passengers will wait with bursting hearts and wallets for the day (in 1941) when the first four-engined forty-two-seater goes into service.

Poor old backward Imperial Airways were carrying almost as many passengers in single machines, and were standardising four-engined layouts way back in 1931. Admittedly the H.P.42s only cruised at 100 m.p.h. or so, while the D.C.4 cruises at more than 200 m.p.h. But we *did* think of it first; the modified Ensigns (forty passengers, four engines and cruising at 170 m.p.h.) will be in service again shortly, and the Fairey F.C.1 (forty passengers, four engines and cruising at 220 m.p.h.) should at least be in service before 1941. Let us enjoy a momentary feeling of equality with, if not of superiority to, our American cousins—while praising all their technical achievements in the world of civil aircraft.

"Flight" photograph.

ELECTRIC: Last week, meteorologically speaking, was one of cold, warm and lukewarm fronts, tendencies to local thunder, and other such odd mixtures which keep C.A.G. aspirants on the ground and raise sailplane pilots to new altitude records. Capt. Percival in his Mew Gull, and *Flight's* chief photographer, went in search of pictorial possibilities. Here is one of them.

The Waafs

ALL old officers and men of the R.F.C. and R.N.A.S. recall with warm feelings the services of the Women's Royal Air Force in the last year of the Great War. Those women and girls did all sorts of useful work, and thereby set free men for other tasks. In particular a vision comes to mind of the smart motor cyclist messengers, immaculately breeched in a blue uniform somewhat more azure than that now worn in the Air Force.

The modern R.A.F., no less than the old-timers, will welcome the re-birth of this useful Service under the rather more appropriate name of Women's Auxiliary Air Force. The dropping of the word "Royal" implies no slur, and will make no difference to the uniform. In the Army, of course, if a Royal regiment were deprived of that distinction and had to change its cherished dark blue facings to white ones, there might be danger of a mutiny; but it is otherwise with the Air Force.

The King's approval of the formation of this new body gratifies a desire which had already been manifested by several companies of the Women's Auxiliary Territorial Service, some of which had of their own initiative decided to adopt certain squadrons of the R.A.F. The gallant squadrons were not in the least disposed to rebuff those advances. Now the liaison—perhaps affiliation is a word which sounds better—between squadron and company will be acknowledged and regularised, and the W.A.A.F.s will get down to the brass tacks of learning to drive squadron transport, tapping squadron typewriters, and maybe cooking squadron dinners, against the time which we hope will never come.

Forthcoming Events

JULY.

Fri., 7th. National Women's Air Reserve: Ball, Hyde Park Hotel, London.

Sat., 8th. Official Opening of Birmingham Airport (Elmdon) by H.R.H. the Duchess of Kent.

Sat., 8th-Sun., 16th. National Gliding Contests, Great Hucklow.

Sat., 8th-Sun., 23rd. Brussels Aero Show.

Sun., 16th-Sun., 23rd. Italian Aero Club: Littorio Rally, Rimini.

Sat., 22nd. Gosport Reunion, Brooklands.

Sat., 22nd-Tues., 25th. Deauville and Plantagenet Air Rallies, France.

Tues., 25th. Alliance Française: Blériot Channel Flight 30th Anniversary Banquet, Dorchester Hotel, London.

Fri., 28th-Sun., 30th. Cannes Aero Club: Deauville-Vichy-Cannes Rally.

Sat., 29th. Civil Aviation Benevolent Fund Air Display, Redhill.

Sat., 29th-Sun., 30th. Frankfurt International Flying Meeting.

AUGUST.

Sat., 5th. Cinque Ports Flying Club: Folkestone Aero Trophy Race.

Sat., 12th. Eastbourne Flying Club: Flying Display and Garden Party.

Fleet Air Arm Units Visited

LEE-on-the-SOLENT

H.Q. Naval Air Station

(Illustrated with "Flight" Photographs)

By
MAJOR F. A. de V. ROBERTSON, V.D.

Lee-on-the-Solent is officially known as H.M.S. *Daedalus*.

IT must have been a very considerable piece of work to organise the Royal Air Force in April, 1918, and it is now likewise a man's job to get the various air stations of the Fleet Air Arm into running order. Rear Admiral R. Bell Davies, V.C., D.S.O., A.F.C., hero of R.N.A.S. flying exploits at Dunkirk and in Turkey, and his Chief Staff Officer, Capt. L. D. Mackintosh, D.S.C., have a busy time before them.

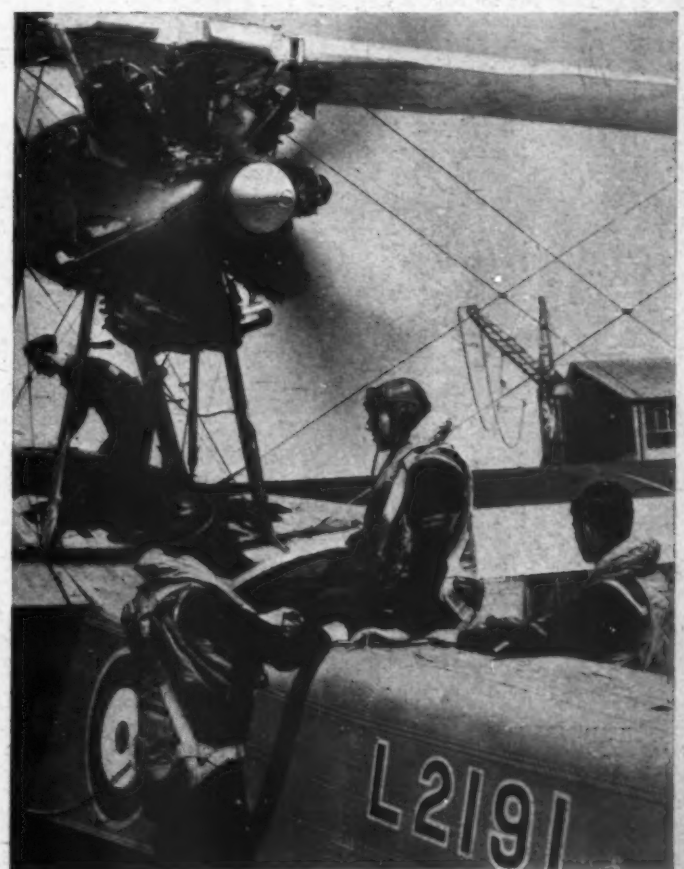
On May 24 the Rear Admiral hoisted his flag in H.M.S. *Dædalus*, which is the official name of Lee-on-the-Solent, and at the same time took over the command of H.M.S. *Peregrine* (Ford), H.M.S. *Kestrel* (Worthy Down), and H.M.S. *Merlin* (Donibristle). Last Saturday, July 1, the number of naval air stations was increased by the handing over by the Air Ministry of Eastleigh (H.M.S. *Raven*) and Lympne (H.M.S. *Buzzard*). The formal handing over did not mean that the R.A.F. disappeared down a trapdoor; the headquarters of the Coastal Command have not yet moved away from Lee, and Air Force uniforms are still seen on the station, though in steadily decreasing numbers.

The Fleet Air Arm is not only busy in organising itself; it is expanding with equal vigour. It follows that training of all sorts is one of the great needs of the moment. Elementary flying training of pilots, both officers and ratings, has wisely been left in the care of the Air Ministry, and is under the most efficient supervision of the C.F.S. The naval pilots are taught to fly at Netheravon. The maintenance artificers also have to be trained at the R.A.F. technical schools. It is less easy to understand why the torpedo school at Gosport is also left in the hands of the R.A.F., as the torpedo is eminently a naval weapon, and the Fleet Air Arm has many more T.S.R. squadrons than the R.A.F. has torpedo-bomber squadrons.

The F.A.A. has to undertake all the specialised naval training of the pilots, and all the training of the observers. At present the training is parcelled out as follows: at Ford is No. 1 Observer School, which trains both officers and ratings; at Lee there is No. 2 Observer School, dealing only with officers, and also a seaplane school; at Worthy Down and Eastleigh they train air gunners, and at Donibristle the pilots learn to land on a dummy deck before going on board the training carrier (at present H.M.S. *Furious*) in the Firth of Forth to learn the art of landing on the deck of a moving carrier.

H.M.S. *Raven* used to be known as Southampton aerodrome, but the F.A.A. intends to call it Eastleigh for the future. It is said that when arrangements were in progress for escorting the King and Queen to Canada some naval personnel were filled with delirious joy at learning that they were to be posted to "Southampton," for H.M.S. *Southampton* was one of the escorting cruisers. I do not know if all the officers immediately exhausted their overdrafts by buying full-dress uniform, but, anyway, their disappointment may be imagined when they discovered that Southampton aerodrome was meant. So henceforth it is to be known as Eastleigh.

The history of air observers in the Navy dates (not counting R.N.A.S. days) from 1921, when six officers were allowed to become observers. One of those six is the present Chief Staff Officer at Lee, Capt. Mackintosh, who has thus as much experience of the business as anybody. In those days the rest of the observers in the carriers belonged to the R.A.F. In 1923 the Balfour Committee decided that all the observers of the Fleet Air Arm were thenceforth to be naval officers, and that they were not (like N.O. pilots) to hold temporary commissions in the R.A.F., though they were to be trained by the R.A.F. in the School of Naval Co-operation at Lee-on-the-Solent. So Lee has a long connection with air navigation over the sea.



A rating pilot, taking the seaplane course, prepares for an instructional flight in a Walrus.

(Left) Ratings receiving instruction in wireless. (Right) An observer officer of the "A" branch deals with a knotty problem in navigation.

The observer course lasts twenty-two weeks, and there are 140 officers in each course at both the schools. That gives some idea of the expansion which is going on in the F.A.A. The observers at Lee belong to the "A" branch and the R.N.V.R., and are midshipmen and sub-lieutenants—the latter all belonging to the "A" branch. "A" branch officers have engaged to serve in the Fleet Air Arm for seven years, with a chance of an extension of eight more years. The R.N.V.R. officers are called up for eighteen months' service with the F.A.A.

The course consists of air navigation by dead reckoning (the only method which is considered practical for an observer who has to find his way back to his parent ship without giving away its position or his own), W/T, photography and spotting for the guns. Photography is not a normal function of the F.A.A., but the observers must be able to photograph coasts, harbours, etc., in case they have to undertake those jobs. Nearly all the officers who come to this school at Lee are quite unversed in naval matters when they begin their training. So the first part of it is spent in H.M.S. *Frobisher*, a training ship, where they get general naval instruction for three weeks. Then they attend the tactical school at Portsmouth, the signal school, and the gunnery school at Whale Island. After that they come to Lee for the most important part of their training.

These officers come from all sorts of civilian callings. Naturally they vary in aptitude, but one and all are extraordinarily keen. One "A" officer was giving up a lucrative post as a chartered accountant, because he preferred dead reckoning in the back seat of an aircraft to the deadly business of reckoning up figures on an office stool.

The officers learn the theory of their subjects in the class-rooms at Lee, but get practice in the air as well. Nos. 753 and 754 Squadrons are stationed at Lee to act as training squadrons. They take the pupil observers up in Shark landplanes (three-seaters), Walrus amphibians (four-seaters) and Seafox floatplanes (two-seaters). Their keenness is easy to understand, for on their ability to navigate correctly depend the lives of themselves and their companions in the aircraft. It is not exactly a simple business to fly across the sea and then find one's way back to one's ship at any time, for it may well be that the carrier has changed position while the aircraft is in the air and out of sight, and then the observer has to use his wits to consider where he is likely to find her. In time of war it may be all-important not to tell the enemy the position of the carrier, and so the use of W/T for finding the way back is to be avoided. It may be remarked that all observers for the F.A.A. are not new entrants from the "A" branch and R.N.V.R. There are still regular R.N. officers, as there have always been since 1921, and, of course, they start with a useful knowledge of navigation, ship recognition, and other naval knowledge which has to be learnt from the beginning by the "A" officers. But it seems that for the present the "A" observers and rating observers will form the majority.

Pilots of the F.A.A. have to be able to fly seaplanes as well as landplanes. The aircraft in a carrier are landplanes (the term "ship-planes" seems to have gone out of fashion), but the catapult machines on the cruisers and capital ships have to be seaplanes of one class or another. The

Observers studying courses, with a Shark waiting in the background.

catapult can get them into the air, but there is no flying deck on which they can land, and so they have to alight on the sea beside the ship and be hauled on board by a crane. That means using seaplanes, and all F.A.A. pilots have to be taught the ways of seaplanes in case they are posted to a catapult flight. The seaplane school at Lee teaches them the various things which they need to know, which mostly concern handling on the water, taking off and landing. In the air there is not so much to learn, as the pilots can fly already. Seafox floatplanes and Walrus amphibians are used, the last-named giving experience in handling flying boats. The pupils who come to the school have mostly done some 150 hours flying, and have sometimes been in a training carrier before they come to Lee.

Night Flying

In addition to learning the watermanship necessary for handling seaplanes, pilots go through a course of night flying over the water. This is mostly carried out in Walruses. When they are about to alight, a boat with a searchlight gives them the direction of the wind, but after that the landing must be done by instruments alone. The course takes ten weeks, and the pilots are then turned out ready for duty in a catapult ship. The actual catapulting course is done at Gosport. About a dozen pupils are dealt with in one course at the seaplane school. The school also gives short refresher courses to pilots who have not flown seaplanes for some time. The school puts in about 200 hours flying a month, and in the past six months has flown by night for 220 hours. Some of the residents round about have not yet come to regard the sound of the pusher engine in the Walrus as an absolute lullaby. As a matter of fact, the pusher, with blades cutting the exhaust stream, makes a simply beastly noise. For all that, the Walrus is an exceedingly useful machine, and makes flying possible at Lee when the sea is too rough for ordinary seaplane work.

It was mentioned above that R.A.F. uniforms are rapidly disappearing from Lee-on-the-Solent. One way in which this happens is by transfers from the R.A.F. to the F.A.A. Quite a number of R.A.F. officers holding short-service commissions for four or six years accepted the offer to transfer to the "A" branch, where they can count on seven years of active flying with a good chance of an extension for eight years more. These transfers of officers have now come to an end, but the transformation of airmen into ratings continues. At Lee many a Naval uniform clothes a man who is utterly incapable of dancing a hornpipe, reefing a topsail, or performing any other essential naval duty (except, of course, splicing the mainbrace), but who is a perfect wizard at coaxing a grumpy engine into action or adjusting the rigging of a Shark—though those last few words sound far more nautical than they were intended to do!

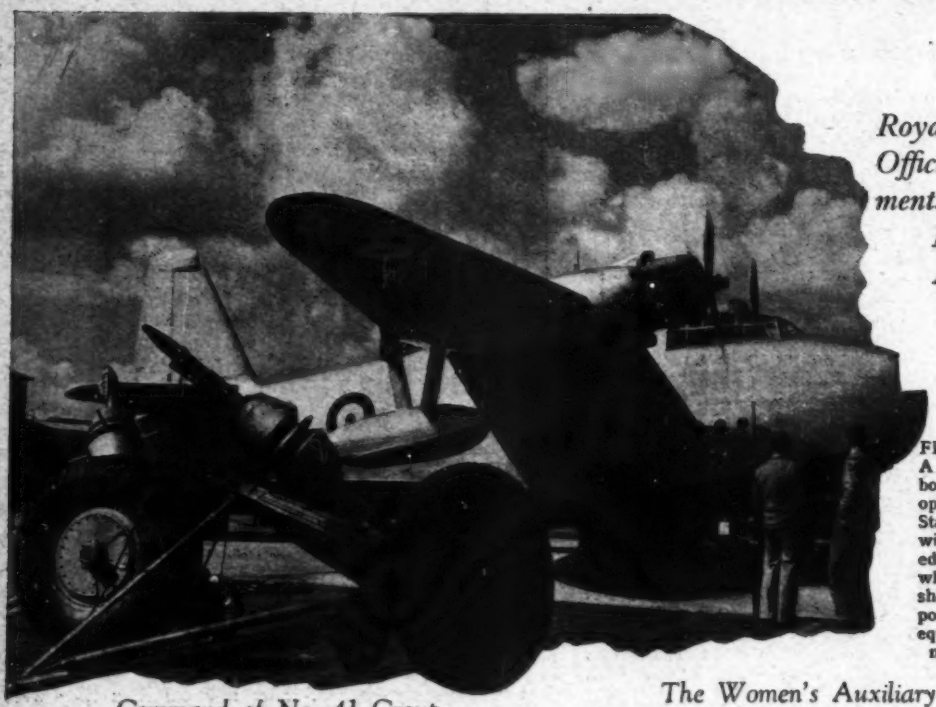
Rear Admiral R. Bell Davies, V.C., D.S.O., A.F.C. (left), Commanding Naval Air Stations, and Capt. L. D. Mackintosh, D.S.C., his Chief Staff Officer.

The Fleet Air Arm is beginning to make itself felt throughout the Navy. Already there are in the Navy List six Captains and 50 Commanders who have been either pilots or observers, not counting men like Rear-Admiral Bell Davies, who was in the R.N.A.S. The F.A.A. rather reminds one of Kipling's lines about the world, "it holds a vast of various kinds of man." At Lee I saw a flight of Skuas give a polished exhibition of flying and dive-bombing. I was told that the pilots and observers in the craft included R.N. officers, R.N. ratings, "A" branch officers, Royal Marine officers and one odd R.A.F. officer. Add to all those the R.N.V.R., and it will be seen that the Fleet Air Arm is an extremely cosmopolitan body.

A flight of Skuas over Lee-on-the-Solent. In the foreground are Sharks.

SERVICE AVIATION

Royal Air Force and Official Announcements: Fleet Air Arm News : Military Aviation Abroad



FIRST IN SERVICE: A Saro Lerwick flying-boat is already being operated from the R.A.F. Station, Calshot. Each wing-tip float is mounted on two struts, which, while being flexible for shock-absorbing purposes, are claimed to be equal in strength to the normally braced type.

Command of No. 41 Group

THE Air Ministry announces the appointment of Air Comdre. George Laing, C.B.E., to assume command of No. 41 Group with effect from July 28, 1939.

Air Comdre. Laing, who was born in 1884, served in the Gordon Highlanders from 1904 and in the Royal Flying Corps from 1912. He served in France during the war, was mentioned in despatches, and for his valuable services was awarded the O.B.E. In 1918 he was in command of No. 1 Stores Depot, Home Establishment, Royal Air Force, and in 1919 was granted a permanent commission in the R.A.F. with the rank of Squadron Leader.

He joined the Air Ministry in 1931 as Deputy Director of Equipment, and has been Principal Deputy Director of Equipment since September, 1938.

He was promoted to the rank of Group Captain in 1927, and to his present rank in 1938.

Notable Promotions

SEVERAL important promotions and appointments among the higher ranks are notified in the *Gazette* this week. Among the officers are A.V.-M. A. S. Barratt, C.B., C.M.G., M.C., promoted to Air Marshal; and three Air Commodores promoted to Air Vice-Marshals — Air Comdre. C. H. B. Blount, O.B.E., M.C., p.s.a., Air Comdre. A. G. Maund, C.B.E., D.S.O., p.s.a., Air Comdre. R. E. S. Paul, D.F.C., q.s.; and Air Comdre. A. T. Harris, O.B.E., A.F.C., q.s.

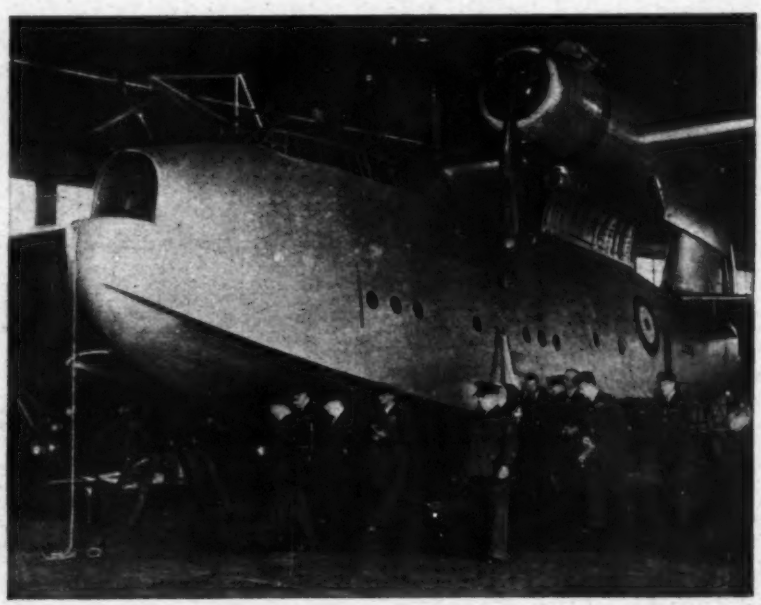
A.V.-M. Barratt, who joined the Royal Artillery in 1910, joined the R.F.C. in 1914, and during the war was with No. 3 Sqn., R.F.C., Nos. 20, 49 and 54 Reserve Squadrons, R.A.F., and was subsequently C.O. of No. 6 Sqn. At the end of the war he held the rank of Lieutenant Colonel. His Service career included appointments at the R.A.F. Staff College, the command of the School of Army Co-operation, and H.Q. duties in India as Senior Staff Officer. He was promoted to Air Vice-Marshal in 1936.

The Women's Auxiliary Air Force

HIS MAJESTY THE KING has approved the formation of a separate women's service, to be called the Women's Auxiliary Air Force, for duty with the Royal Air Force in time of war. His Majesty has also approved for this Force a uniform of Royal Air Force blue; this was worn in public for the first time by a detachment of the Women's Auxiliary Air Force at the National Defence Rally at Hyde Park on Sunday, July 2.

Miss J. Trefusis Forbes, previously an officer in the Auxiliary Territorial Service, has been appointed to the Air Ministry as Director of the Women's Auxiliary Air Force with the rank of Senior Controller.

The personnel of the present Royal Air Force Companies of the Auxiliary Territorial Service will be invited to enrol in the new force. These companies, 48 in number, have been raised in 34 counties by the Territorial Army and Air Force Associations and Territorial Army Associations. They will continue to be officer and



SIR KINGSLEY WOOD inspecting one of the Lerwicks at the Saunders-Roe works. The Lerwick has two Bristol Hercules engines driving de Havilland constant-speed airscrews and has the following measurements: length 63ft., span 81ft. and height 20ft.

N.C.O. producing units, i.e., they will be units whose purpose is to train the women officers and N.C.O.s who would be required to administer the expanded force expected to be recruited in time of war. They will be grouped geographically under area administrators and each company will be affiliated to a flying squadron or balloon centre of the Auxiliary Air Force, or, in districts where there is no conveniently situated Auxiliary Air Force unit, to Royal Air Force units.

For the present the women enrolled, being destined to be officers or non-commissioned officers, will be trained merely as administrators, but they will receive also general trade training (at the Royal Air Force and Auxiliary Air Force stations to which the companies are affiliated) in the duties expected to be entrusted to the women who will be enrolled in time of war, i.e. cooks, mess orderlies, equipment assistants, motor drivers, clerks and fabric workers. Personnel of a high standard is required.

The ordinary age limits are 18 to 43, but applicants with war experience or special qualifications may be considered up to the age of 50.

Mission's Recommendation for N.Z.

REPLYING to a private notice question by Mr. Arthur Greenwood, M.P., the Secretary of State for Air made the following statement in the House of Commons:—

"I am glad to be able to announce that complete agreement has been reached between His Majesty's Government in New Zealand and His Majesty's Government in the United Kingdom on the recommendations of the recent Air Mission to New Zealand and certain matters arising out of it.

"These recommendations have two inter-related aims, namely: (i) The creation in New Zealand of manufacturing capacity for the production of aircraft; (ii) the expansion of training facilities in the Dominion with a view to increasing the output of fully trained flying personnel for the Air Forces of both countries in peace and war.

"With this end in view, the Mission recommended, first, that the New Zealand Government should place an immediate order for training aircraft to be manufactured in New Zealand by the De Havilland Company, which will enable the company to proceed at once with the establishment of an aircraft factory in the Dominion: and, secondly, the establishment of further flying training facilities in New Zealand. In this latter connection I should explain that there has been in operation for some time a scheme under which a number of Dominions pilots have been trained annually for the Royal Air Force. The additional training facilities now to be established will enable the number to be raised to 220 a year in peace, and would put New Zealand in a position to send overseas, in the event of war, not less than 1,300 fully trained pilots and other flying personnel annually.

"The New Zealand Government have intimated that they have decided to implement both these recommendations at once; and by way of contribution to the cost involved in these two important projects the United Kingdom Government have agreed to make an increase in the grants paid under the present training scheme.

"I am sure that the House will agree that the further assistance thus given by the Dominion of New Zealand will be a most valuable contribution to Imperial Defence.

"I should also like to take this opportunity of expressing the thanks of His Majesty's Government to Sir Hardman Lever and his colleagues for their valuable work."

Flying Accidents

THE Air Ministry regrets to announce the following accidents:—

P/O. Sydney Herbert Lyttle (flying solo) lost his life in an accident which occurred near Saffron Walden on June 21 to an aircraft of No. 29 Squadron.

F/O. Joseph Leonard John Rowland lost his life and F/O. Noel Hill was seriously injured in an accident which occurred at Desford on June 23 to an aircraft of No. 7 Elementary and Reserve Flying Training School.

P/O. Anthony D'Orton Lamarque died in Newark Hospital on June 24 as the result of injuries received in an accident which occurred at Stubton on June 24 to an aircraft of No. 73 Squadron.

Sgt. John Elevys Morgan (flying solo) lost his life in an accident which occurred near Dartford on June 25 to an aircraft of No. 20 Elementary and Reserve Flying Training School, Gravesend.

F/O. William Oliver Chambers Hemmings (flying solo) lost his life in an accident which occurred at West Dean, Sussex, on June 26, to an aircraft of No. 1 Squadron.

Royal Air Force Gazette

Air Ministry, June 30

Royal Air Force

General Duties Branch

Air Marshal Sir Charles S. Burnett, K.C.B., C.B.E., D.S.O., is appointed an additional Inspector General of the Royal Air Force (July 1); Flt. Lt. F. C. Richardson is granted a permanent commission in that rank (June 6).

The following are granted short-service commissions as Acting Pilot Officers on probation for six years on the active list (June 10):—P. O. D. Allcock, R. B. Barrett, O. W. Bligh, N. O. Clements, W. L. Colmer, J. S. G. Crawford, F. J. Curtis, L. R. Darwen, A. H. Davies, A. D. Frampton, C. W. Harper, E. A. C. Hill, B. J. Hooper, J. F. Howitt, R. F. Leavitt, M. E. G. Mailer, I. M. Muir, T. McN. Ormiston, F. H. Robertson, D. A. A. Romans, C. D. Stevens, J. A. Walker, G. Washington, W. A. Waterton.

The following are granted short service commissions as Acting Pilot Officers on probation for four years on the active list (June 10):—D. Bayliss, R. M. Curtis, A. G. Dagg, W. T. Davies, F. V. S. Goodman, E. R. Hale, A. B. Lawton, B. B. Little, D. MacDonald, H. J. Mann, A. J. Rippon, W. R. Sloane, E. Walker.

The following Pilot Officers on probation are confirmed in their appointments on the dates stated:—R. W. A. Gibbs (March 20); S. P. V. Bird (May 31).

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers on the dates stated:—S. C. Holbrow, W. B. Price-Owen (May 10); J. N. Thornewell (May 12). (Substituted for notification in *Gazette* of August 16, 1938, concerning these officers.)

The following are promoted (July 1):—

Air Vice-Marshal to be Air Marshal.—A. S. Barratt, C.B., C.M.G., M.C.

Air Commodores to be Air Vice-Marshals.—C. H. B. Blount, O.B.E., M.C.; A. G. Maund, C.B.E., D.S.O.; R. E. Saul, D.F.C.; A. T. Harris, O.B.E., A.F.C.

Group Captains to be Air Commodores.—J. H. D'Albiac, D.S.O.; G. B. A. Baker, M.C.; R. M. Drummond, D.S.O., O.B.E., M.C.; A. Coningham, D.S.O., M.C., D.F.C., A.F.C.; F. J. Linnell, O.B.E.

Wing Commanders to be Group Captains.—A. S. Ellerton, O.B.E.; G. W. Bentley, D.F.C.; R. Young; E. F. Turner, A.F.C.; L. G. Le B. Croke; P. F. Fullard, D.S.O., M.C., A.F.C.; H. O. Long, D.S.O.; C. E. W. Lockyer; P. D. Robertson, A.M.

Squadron Leaders to be Wing Commanders.—G. H. Randle, V. Croome, E. H. M. David, N. C. Ogilvie-Forbes, P. J. A. Hume-Wright, C. S. Riccard, F. E. Watts, H. M. A. Day, A.M., R. H. Haworth-Booth, D.F.C.; V. B. Bennett, R. B. Jordan, G. E. Nicholetts, A.F.C., F. J. Fressanges, N. A. P. Pritchett, C. B. Greet, W. L. Payne, H. E. King, N. Carter, D.F.C., M. H. Garons-Williams, G. R. O'Sullivan, E. F. Haylock, R. W. Hill, D. W. F. Bonham-Carter, L. K. Barnes, M.B.E., J. S. L. Adams.

Flight Lieutenants to be Squadron Leaders.—B. W. Knox, D. S. Kite, R. J. Knights-Whittome.

F/O. (Acting Flt. Lt.) T. S. Rivett-Carnac is promoted to the rank of Flight Lieutenant (June 14).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—S. A. F. Robertson (April 23); J. C. Hunter (May 12); C. T. V. Craxton (May 24); R. Langebear, J. W. Baird, E. B. Morse, L. V. E. Atkinson, R. J. McConnell, J. W. Graafstra (June 16); J. B. Grant, T. A. F. Elsdon, H. F. G. Ede, T. J. Geach (June 18); E. W. Young, S. G. Stilling, A. M. G. Lywood, N. R. Irving, A. I. Robinson, G. Harries, R. F. Marrack (June 21).

F/O. (Acting Flt. Lt.) R. H. A. Lee takes rank and precedence as if his appointment as Flying Officer bore date May 19. Reduction to take effect from May 19.

The following Flight Lieutenants cease to be seconded to the Royal Air Force on return to Army duty (May 19):—T. K. Lacey (Captain, The Gloucestershire Regt.); P. Wolryche (Captain, R. Tank Corps).

Flt. Lt. J. Y. Humphreys resigns his permanent commission (June 17).

The short-service commissions of the following Acting Pilot Officers on probation are terminated on cessation of duty on the dates stated:—G. D. Dillabrough (June 15); C. A. S. Ring (June 22).

Equipment Branch

The following are promoted (July 1):—

Wing Commanders to be Group Captains.—A. Garrity, H. L. Woolveridge, O.B.E.

Squadron Leaders to be Wing Commanders.—E. N. D. Worsley, F. W. Taylor, R. T. Rich, C. W. Rugg, C. N. Scott, L. J. V. Bates, W. Bourne, O.B.E., F. B. Ludlow, O.B.E., M.C., G. G. C. Pigott, E. A. Burridge, F. C. C. B. Hichens, J. H. P. Clarke, G. Scarrott, F. H. Bedford, M.C., M.M., O. G. Ridley, M.C.

Accountant Branch

Flying Officer on probation H. Murray is confirmed in his appointment (June 2).

The following are promoted (July 1):—

Wing Commanders to be Group Captains.—H. F. Fuller, W. G. W. Prall.

Squadron Leaders to be Wing Commanders.—J. F. R. Eales-White, A. C. Lobley, A. J. Moore, V. G. A. Bennett.

Medical Branch

The following are granted short-service commissions as Flying Officers for three years on the active list with effect from June 5 and with seniority of the dates stated:—H. M. Carson, M.B., B.Ch., J. MacL. Clark, M.B., Ch.B., J. Crawford, M.B., Ch.B., J. D. Jones, M.R.C.S., L.R.C.P., F. Summers, M.R.C.S., L.R.C.P., M.B., B.S., H. J. Trenchard, M.B., Ch.B., H. H. Winfield, M.B., Ch.B. (June 5, 1938); C. G. G. Mackay, M.B., Ch.B., C. W. S. Marris, M.R.C.S., L.R.C.P., H. S. Samuel, M.R.C.S, L.R.C.P. (June 5).

The following are promoted (July 1):—

Wing Commander to be Group Captain.—W. E. Hodgins, M.B., M.C.P. and S.

Squadron Leaders to be Wing Commanders.—G. E. Church, M.B., Ch.B., L.R.C.P. and S., D.M.R.E., D.M.R.; F. H. C. L. B. Crawford, M.B., B.Ch., D.P.H.; J. Magner, M.D., B.Ch.; N. I. Smith, M.D., Ch.B.; H. Penman, M.B., Ch.B., D.O.M.S.; J. Hill, M.B., Ch.B., D.P.H.

F/O. P. J. MacNamara, L.R.C.P. and S., is promoted to the rank of Flight Lieutenant (May 30).

Dental Branch

J. N. Pimblett, L.D.S., is granted a non-permanent commission as Flying Officer for three years on the active list (June 5).

SIR KINGSLEY WOOD AT "A.S.T." AND "A.S." : On the left our energetic Air Minister is seen making the rounds at Air Service Training, Ltd., Hamble, while on the right he is studying a process in the manufacture of an Armstrong Siddeley Cheetah radial engine.

Commissioned Engineer Officers

The following Warrant Officers are granted commissions as Flying Officers on probation with effect from the dates stated and with seniority of June 12:—H. Vatcher, M.B.E., A. H. Perry, A. E. Wyatt, J. W. Faulkner, F. H. Pearce, E. Dracup, J. Balshaw, R. Dickinson, A. H. King, W. B. Lang, A. S. Robbins, R. J. Chedd, M.S.M., A. B. Collins, A. E. Blundell, W. M. Matthews, J. Nash, P. Dobbins, W. J. Elvin, F. Hills, F. H. Ward, G. F. Cockell, A. H. Burleigh, P. W. J. Dawes, W. J. James, W. S. Reed, M.B.E., A. R. Clark, G. W. Goat, R. J. B. Jackson, T. U. Pollitt, J. E. Horton, W. A. Easdown (June 12); E. R. J. Taylor, E. F. Westwood, R. S. Roberston, G. Prigmore, R. C. Pearson, J. E. Brown, A.F.M., W. H. Geddes (June 19).

The following Flying Officers on probation are confirmed in their appointments on the dates stated:—W. G. Womersley (April 20); H. V. Hughes, A.F.M. (May 19); J. A. C. Robinson (June 1).

Commissioned Signals Officers

The following Warrant Officers are granted commissions as Flying Officers on probation with effect from the dates stated and with seniority of June 12:—C. Osmond (June 12); R. Tibbey, S. V. Vaizey, S. C. W. Rudd (June 19).

Commissioned Armament Officer

W/O. A. Dunn is granted a commission as Flying Officer on probation (June 19).

The following Flying Officers on probation are confirmed in their appointments (June 2):—W. H. G. Hampshire, W. J. Ralphs.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Flt. Lt. H. Thomas is granted a commission as Flight Lieutenant in Class C with effect from June 13 and with seniority of November 8, 1928; C. A. C. Patton is granted a commission as Flying Officer in Class C with effect from June 27 and seniority of May 16, 1932.

The following are appointed to commissions in Class CC as Flight Lieutenants with effects from the dates stated and are granted the honorary rank of Squadron Leader with effect from April 1:—J. S. F. Hood (September 29, 1938); Capt. H. V. S. Willcox, M.C. (R.M., Ret.) (March 13).

G. Milner is granted a commission in Class CC as Flight Lieutenant (February 6); Lt. H. V. Smith, D.C.M. (R.A.R.O.), is granted a commission in Class CC as Flying Officer (March 26).

Flt. Lt. R. C. Bryant is granted the honorary rank of Squadron Leader in Class CC (April 1); Flt. Lt. D. G. Fleming (Flight Lieutenant, R.A.F., Ret.) is granted the rank of Squadron Leader in Class CC (May 1); P/O. P. C. W. Disney is transferred from Class AA to Class C (March 30); Wing Cdr. (Honorary Air Commodore) B. C. H. Drew, C.M.G., C.V.O., C.B.E. (Air Commodore, R.A.F., Ret.), relinquishes his commission in Class CC (March 8); F/O. H. Garnett relinquishes his commission on completion of service and is permitted to retain his rank (April 16).

Royal Air Force Volunteer Reserve

General Duties Branch

The undermentioned are granted commissions as Pilot Officers on the dates stated:—R. Ambrose, N. Bicknell, V. R. H. Ferguson, K. I. Geddes, P. Harding, R. C. Pargeter, D. K. Redford (June 20); the Hon. D. A. Coke, A. G. Evill, W. J. Boston Wadie (June 27).

F/O. R. D. Bednell relinquishes his commission on completion of service and retains his rank (June 12).

Equipment Branch

Acting Pilot Officer on probation C. E. Jackson is confirmed in his appointment (May 8). (Substituted for notification in *Gazette* of June 9.)

Auxiliary Air Force

No. 600 (CITY OF LONDON) SQUADRON.—Flt. Lt. R. G. Kellett is transferred to No. 616 (South Yorkshire) Squadron (March 20).

No. 605 (COUNTY OF WARWICK) SQUADRON.—Flt. Lt. W. B. Beale relinquishes his commission (January 10).

No. 903 (COUNTY OF LONDON) SQUADRON.—E. F. Taylor is granted a commission as Acting Pilot Officer (June 7).

No. 907 (COUNTY OF MIDDLESEX) SQUADRON.—G. M. Christian is granted a commission as Pilot Officer (June 2).

No. 915 (COUNTY OF WARWICK) SQUADRON.—E. C. Lawledge is granted a commission as Acting Pilot Officer (March 22).

No. 919 (WEST LANCASHIRE) SQUADRON.—G. E. Harding is granted a commission as Acting Pilot Officer (May 19).

No. 920 (WEST LANCASHIRE) SQUADRON.—D. H. Nield is granted a commission as Pilot Officer (May 17).

No. 921 (WEST LANCASHIRE) SQUADRON.—Capt. L. W. Shepherdson, M.C., is granted a commission as Pilot Officer (May 16).

No. 922 (WEST LANCASHIRE) SQUADRON.—The following are granted commissions as Acting Pilot Officers on the dates stated:—M. Brooking (May 21); the Hon. J. S. T. Hawke (May 23); R. Godfrey (May 25); F. R. Terras (May 31).

No. 923 (WEST LANCASHIRE) SQUADRON.—The following are granted commissions as Acting Pilot Officers on the dates stated:—J. W. Huggins (May 1); A. Walker (May 29).

No. 924 (EAST LANCASHIRE) SQUADRON.—W. T. Barnes is granted a commission as Squadron Leader and appointed to the command of the squadron (May 12); A. C. Neill is granted a commission as Acting Pilot Officer (May 16).

No. 925 (EAST LANCASHIRE) SQUADRON.—S. G. Barlow is granted a commission as Flight Lieutenant (May 17).

No. 926 (EAST LANCASHIRE) SQUADRON.—C. F. P. Lowe is granted a commission as Flying Officer (May 16).

No. 929 (COUNTY OF GLOUCESTER) SQUADRON.—W. G. H. Hedges is granted a commission as Acting Pilot Officer (April 25).

No. 930 (HAMPSHIRE) SQUADRON.—Maj. G. C. Maxwell, M.C., D.F.C., A.F.C., is granted a commission as Flight Lieutenant (May 23).

No. 931 (HAMPSHIRE) SQUADRON.—The following are granted commissions in the ranks and on the dates stated:—Flying Officer, Capt. H. Sherwood (May 23); Acting Pilot Officer, S. W. Messenger (May 25).

No. 940 (WEST RIDING) SQUADRON.—H. Hall is granted a commission as Squadron Leader and appointed to the command of the squadron (April 24); W. S. Pattinson is granted a commission as Flight Lieutenant (May 16).

No. 941 (WEST RIDING) SQUADRON.—The following are granted commissions as Pilot Officers on the dates stated:—G. K. Marshall (May 7); R. G. A. Colley (May 15).

Accountant Branch

No. 909 (COUNTY OF ESSEX) SQUADRON.—G. P. G. de Worms is granted a commission as Pilot Officer (May 26).

No. 910 (COUNTY OF ESSEX) SQUADRON.—J. F. Venner is granted a commission as Pilot Officer (May 31).

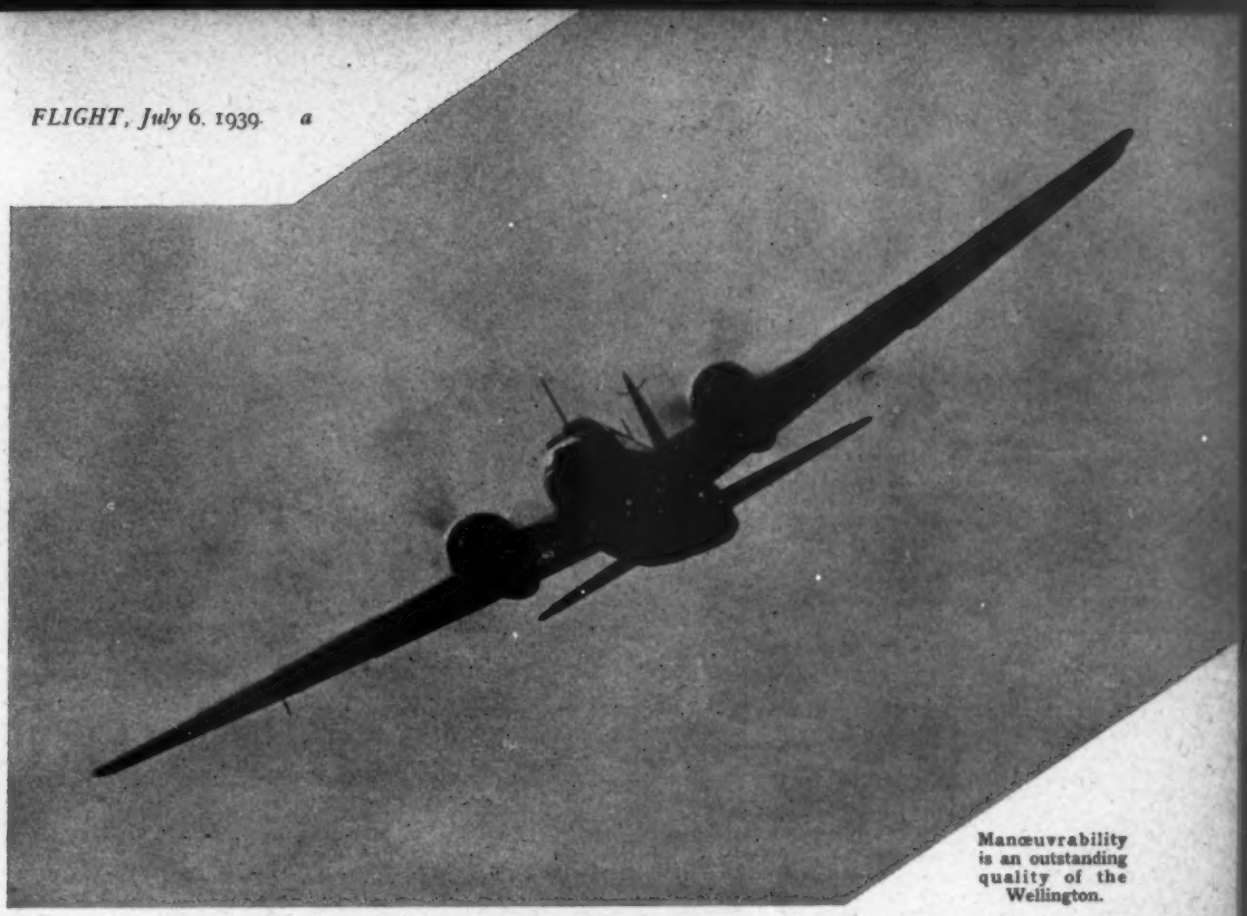
Medical Branch

No. 616 (SOUTH YORKSHIRE) SQUADRON. — S. E. Osborne, L.M.S.S.A., is granted a commission as Flying Officer (April 29).

No. 920 (WEST LANCASHIRE) SQUADRON.—J. Halton, M.B., Ch.B., is granted a commission as Flying Officer (April 25).

General List

Flt. Lt. W. B. Beale is appointed to the General List in that rank with effect from January 10 on relinquishing his commission in No. 605 (County of Warwick) Squadron.



Manœuvrability is an outstanding quality of the Wellington.

GEODETICS on the GRAND SCALE

A Detailed Description of the Vickers-Armstrongs Wellington I : Exceptional Range and Large Bomb Capacity : Ingenious Structural Features

(Illustrated mainly with "Flight" Photographs and Sketches)

IT is extremely unlikely that any foreign air force possesses bombers with as long a range as that attainable by the Vickers-Armstrongs Wellington I (Type 290), which forms the equipment of a number of squadrons of the Royal Air Force and of which it is now permissible to disclose structural details.

The Wellington's capacity for carrying heavy loads over great distances may be directly attributed to the Vickers geodetic system of construction, which proved its worth in the single-engined Wellesley used as standard equipment in a number of overseas squadrons of the R.A.F. But the qualities of the Wellington are not limited to load-carrying. It has a top speed of 265 m.p.h. (or considerably more when fitted with Rolls-Royce Merlin or Bristol Hercules engines in place of the Pegasus XVIIIs); it has provision for five turreted machine-guns; it is quite exceptionally roomy, and it is amazingly agile in the air.

The Bristol Pegasus XVIII engines fitted as standard in

The Wellington, with its extremely long range, has comprehensive tankage arrangements. The tanks (riveted by the De Bergue system) taper in conformity with the wing.

The rear section of the fuselage, looking toward the tail turret, with the chute for the reconnaissance flares protuding on the left amidships.

the Mark I Wellington is a two-speed supercharged unit with the following ratings: Take-off power, 965 h.p. at 2,475 r.p.m.; international power (using medium supercharge), 780/815 h.p. at 2,250 r.p.m. at 4,750ft.; international power (using full supercharge), 720/750 h.p. at 2,250 r.p.m. at 14,750ft.; maximum power (medium supercharge), 1,000 h.p. at 2,600 r.p.m. at 3,000ft.; maximum power (full supercharge), 885 h.p. at 2,600 r.p.m. at 15,500ft.

The Wellington's engines drive De Havilland three-bladed constant-speed airscrews with a diameter of 12ft. 6in. They are carried on mountings bolted to the fireproof bulkhead frames, the installation being designed to allow quick replacement of a power unit. In addition to the usual Bristol long-chord gilled cowling with trailing-edge cooling gills, the engines are provided with louvred "dish-pan" cowlings over the crankcases.

The exhaust on the port engine heats a boiler, the steam from which passes through a heater in the wing root; air warmed in the heater flows into a fore-and-aft duct running practically the whole length of the fuselage.

Each engine has its own fuel system, handling 500 gallons made up as follows: One main tank in engine nacelles (60 gal.); three wing tanks in front of spar in outer wing panel (138 gal.); three wing tanks behind outer spar (162 gal.), and one "overload" tank in the bomb compartment. The tanks are made of Alclad, the overload tanks being cylindrical in shape and secured in the bomb bays by straps. All fuel is available to either engine if required.

When the Wellington is making short- or medium-range flights the engines draw oil from tanks in the nacelles, but for long-range work an additional tank with a pump is fitted on the starboard side of the cabin. Apart from a thermostatically controlled Serck oil cooler and a Tecalemit oil cleaner for the main oil system, there is an additional Tecalemit cleaner for the two-speed blower system.

The "hydraulics" are of interest in that there are two separate systems. Of these the primary circuit supplies the undercarriage and tail wheel, the flaps, and the mechanism for operating the bomb doors, while the other

This aerial photograph gives a good idea of the Wellington's external appearance. It also shows the excellent provision for admitting daylight.

A striking study showing the formation of the geodetic structure and the interior as seen from the rear catwalk. On the left is the hot-air pipe which runs practically the whole length of the fuselage.

The Wellington I normally carries a crew of four, made up of a pilot, a front gunner (who is also the bomb aimer or navigator), a wireless operator (who acts alternatively as the midships gunner), and a rear gunner. Provision is made to carry a fifth man.

The cabin—which, due to the geodetic construction, provides a large amount of unobstructed space—is exceptionally well lighted for a military machine, thanks to the deletion of fabric over a number of the geodetic panels. From the cabin proper a catwalk extends through the fuselage to the tail gun turret. In the nose, just behind the turret, is a prone position for the bomb aimer. This section of the fuselage is provided with a large trap door for emergency exit; it is spring-loaded and operated by a pedal. Additional emergency exits are provided farther aft in the fuselage, and the occupants of the nose and tail turrets are provided with firemen's axes to enable them to hack through the Perspex enclosures.

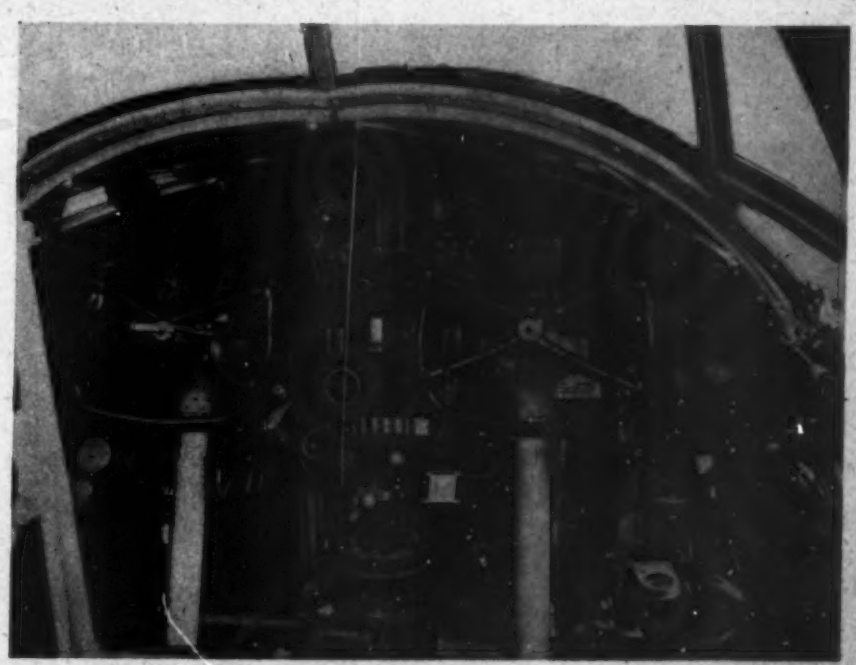
A number of the machines delivered have dual controls, but these are not normally fitted for active service.

Equipment, in addition to an elaborate wireless and D/F installation, comfortable navigating facilities and an automatic pilot, includes an inflatable dinghy housed in the port engine nacelle; a lavatory; a rest bunk; stowage for

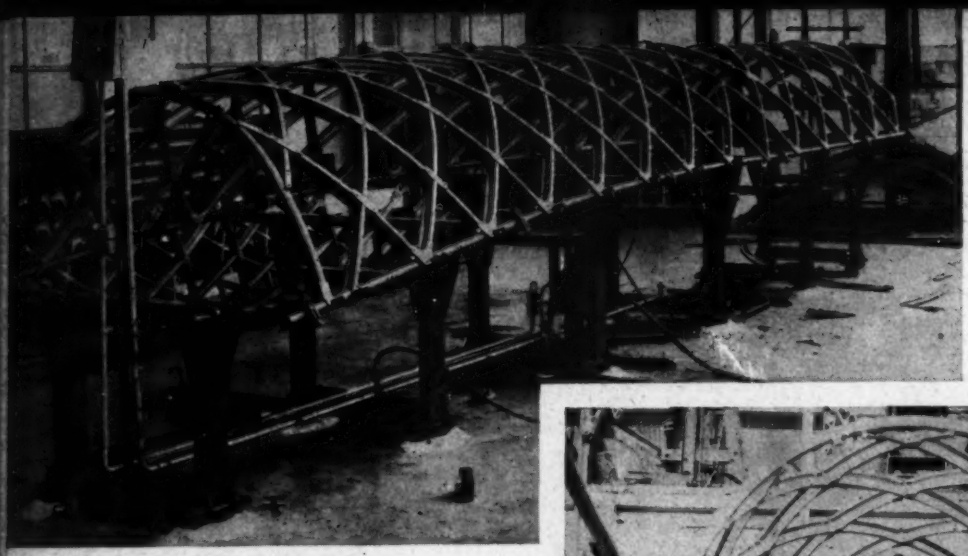
system actuates the rotating, elevating, and depressing of the guns in their turrets.

The undercarriage comprises the two main wheels and the tail wheel, all of which retract simultaneously under hydraulic power, their positions being signalled by visual and audible means. Each unit of the main gear embodies a double-acting hydraulic jack in conjunction with a twin-leg transversely braced assembly with a folding backstay. All three wheels are completely enclosed during flight.

As at present in service the Wellington has Vickers power-driven gun turrets in the nose and stern, the forward turret housing one machine gun, and the rear turret two of these weapons. Provision is made in the bottom of the fuselage for the installation of a power-driven retractable turret housing another two.

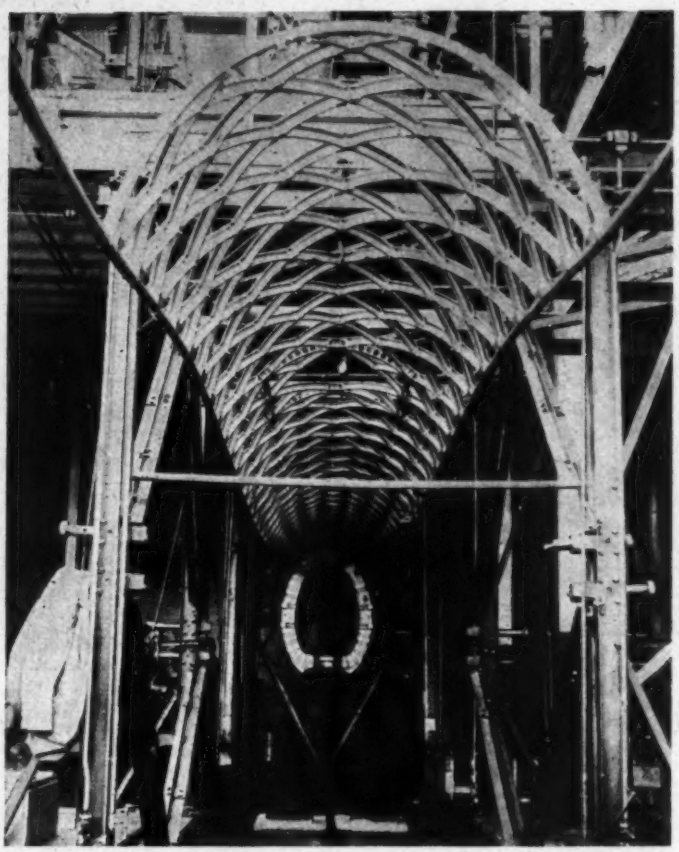


A certain number of the Wellingtons delivered to the R.A.F. are fitted with dual control, as shown here. The visual indicator for the undercarriage occupies the central position on the main instrument panel.



(Left) Top panel of rear fuselage portion in its jig.

(Below) Fuselage top panel temporarily supported in jig in readiness for attachment to fuselage sides. In the background can be seen one of the tailplane frames.



ten Thermos flasks; sea markers and flame floats; two retractable landing lights in the port wing; provision for landing flares in the wing roots; a launching chute amidships for parachute flares; and formation-keeping lights. Soundproofing is now being incorporated as standard.

The Wellingtons for New Zealand are having flotation bags installed in their bomb compartments for the delivery flight, and arrangements are made in these machines to jettison the fuel from the wing tanks which, when empty, supply a very useful measure of flotation.

In addition to the usual fire extinguishers, there is a Graviner installation in the engine nacelles for surrounding the rear of the engine with carbon-dioxide gas.

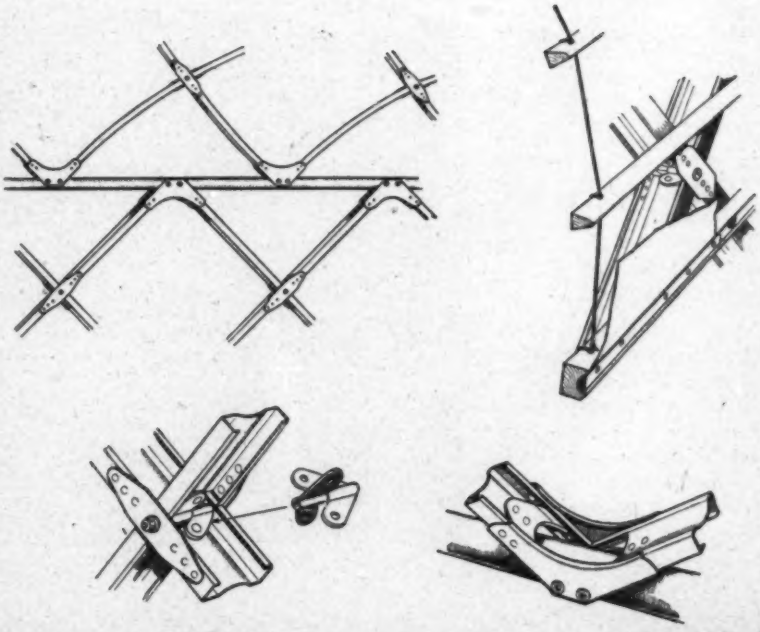
Eleven inter-communication sockets (microphone or telephone) are provided, one each for the front gunner, prone bomber, first and second pilots, wireless operator, navigator, and "spare passenger."

Flying in the Wellington

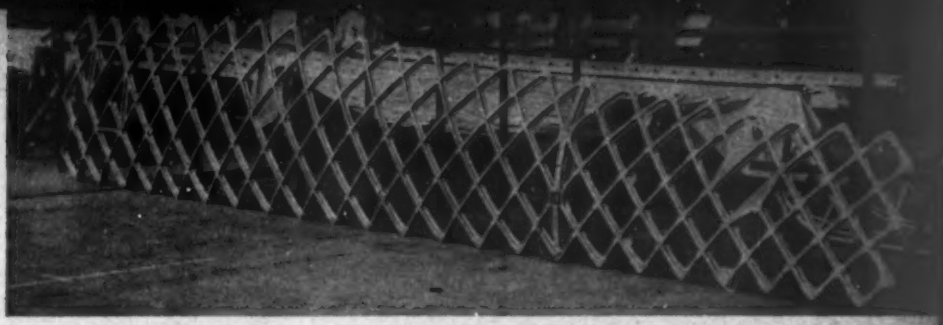
It was refreshingly pleasant on a sweltering afternoon at Brooklands to stand alongside Flt. Lt. Maurice Hare who, with Flt. Lt. J. Summers (chief test pilot to Vickers-Armstrongs, Ltd.), puts the Wellingtons through their tests prior to delivery. One stood, bracing oneself in the doorway leading from the cabin, no second pilot's seat being installed.

The take-off of the Wellington is exceptionally good, as demonstrated at quite a number of displays. The Mark III version, with Bristol Hercules engines giving something like 1,300 h.p. each, has an even quicker getaway.

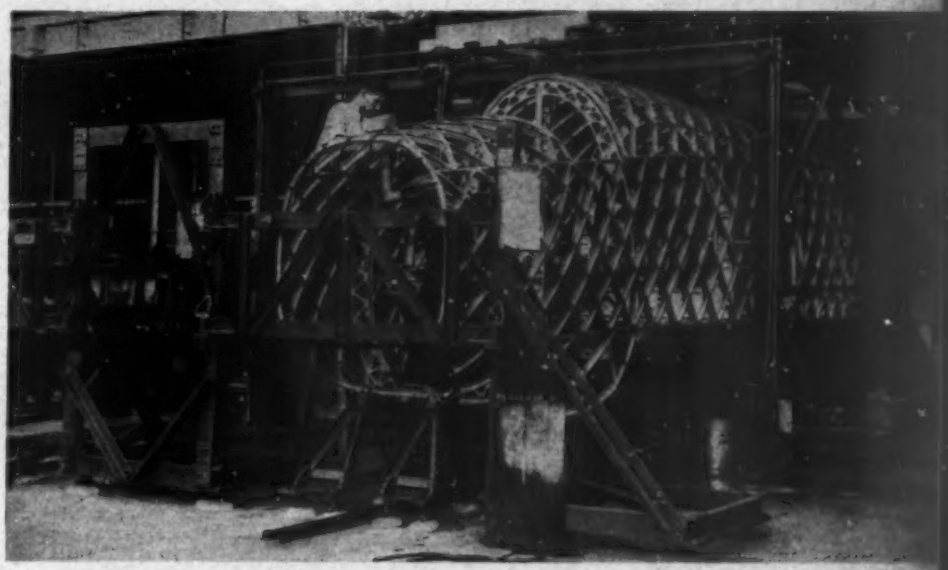
At 4,000ft. we were climbing fast at rather less than 3 lb. boost and 115 m.p.h. on the A.S.I. We kept on to 9,000ft., sending the hand of the sensitive altimeter chasing itself round the dial. Normally, the supercharger speed is not changed under about 10,000ft., when the boost has dropped to +½ lb., but Flt. Lt. Hare, to save the trouble of going any higher, throttled back until the boost gauge registered +¼, and switched the blowers into high gear, sending the



The four sketches show (top left) how the attachment points of the top and side fuselage panels are staggered; (top right) how the main stringers are bolted to the geodesics, but intermediate stringers are merely located by cords—the fabric is attached to the main stringers only; (bottom left) how, where the geodesics cross, they are secured by "butterflies"; and how the geodesics are attached to the longerons.



One of the complete side panels of a fuselage, ready to be put in the jig for attachment to the top and bottom panels. Below is seen a fuselage nearing completion in its assembly jig.



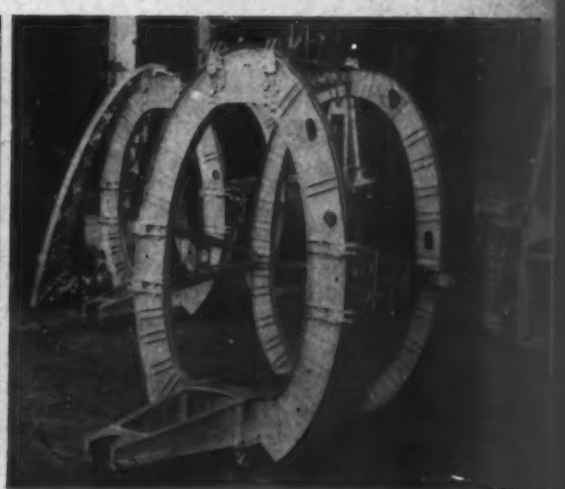
needles round to +3. It takes about 4 seconds for the hydraulically operated gear change to do its work. It may be remembered that the impeller/crankshaft speed ratio is changed through the medium of three double-acting hydraulic clutches operated by oil under pressure from the main lubrication system. There is no possibility of the control valve remaining in any intermediate position.

Banks almost to the vertical with the clock showing something like 180 m.p.h. produced surprisingly little "G," and, like the homeward dive at something well over 200 m.p.h., gave a feeling of solidity.

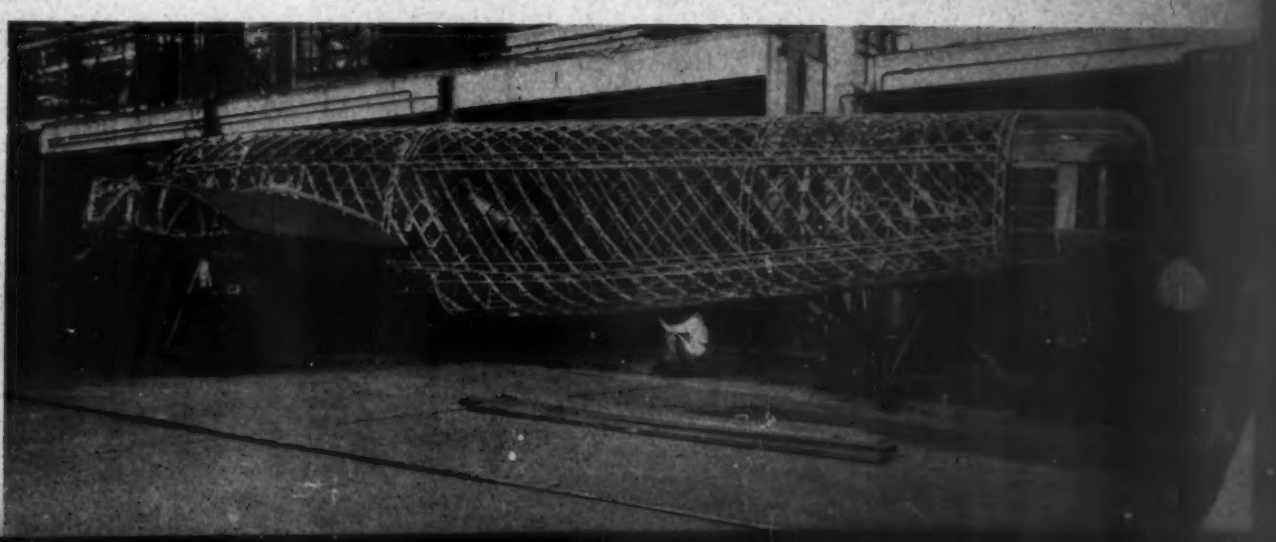
Flt. Lt. Hare was good enough to demonstrate the well-known "Summers side-slip" approach, which was just another proof of the tractability of this formidable instrument of national defence.

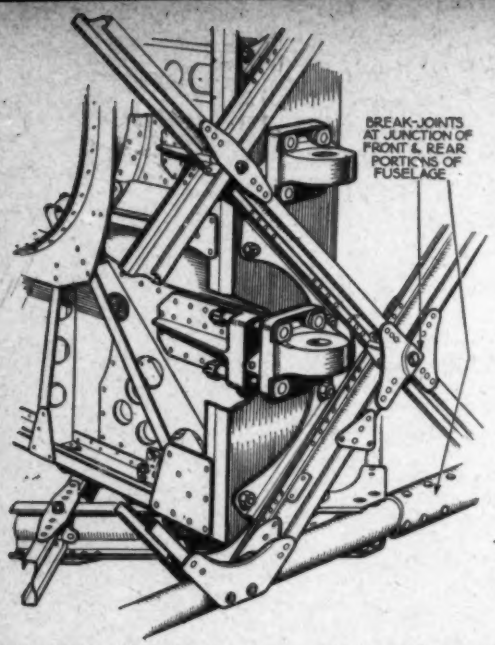
Construction

Turning to the structural and assembly aspect, there is no doubt that, from the point of view of greater ease of production, the Wellington is a considerable improvement on the Wellesley, described and illustrated in *Flight* of December 8, 1938. Fundamentally, the two types of structure are similar in that they are based on the geodetic principle, but nearly all

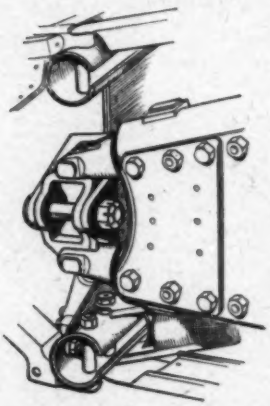


A main spar fuselage frame. This serves as one of the key foundations for the whole fuselage assembly. On the far right is the double frame which carries the tailplane and tailwheel. This is assembled as a complete unit. (Below) A fuselage with its primary structure complete and the wing centre-section attached.





(Left) Details of the construction of a fuselage main frame : The side panels are attached by slightly channeled plates riveted to the geodesics and bolted to the fuselage frame. The lugs for spar attachment are bolted through to stress-distributing forgings on the inside.



The main spar passes through the fuselage but is not attached to it. The front and rear spars are joined to the fuselage frames by cardan joints, as shown in this sketch.

the details differ in the two machines. This applies to both the fuselage and the wing. The magnitude of the order has been such that it has become possible to make much greater use of forgings and stampings, particularly for securing the ends of the geodesics and for the joints at the points where two bars cross one another.

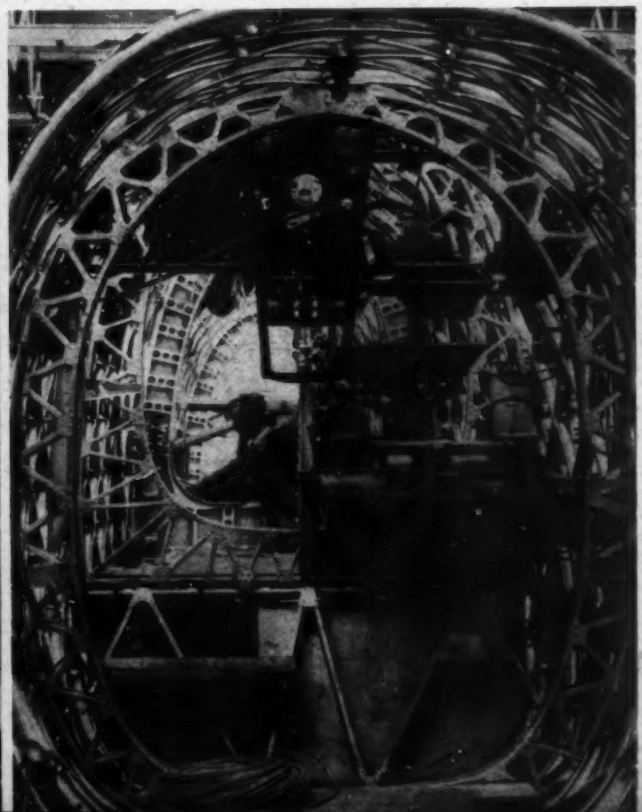
In the Wellesley, it may be remembered, the main scheme was to split the fuselage transversely into a number of fairly short units, each unit being completely stabilised (structurally speaking) in itself and joined to the next by a form of pipe-union joint. In the Wellington, on the contrary, the tubular longerons run almost through from nose to stern (excepting the extremes, which are separate units, "buttoned on"), joints in them being made by plain sleeves instead of the somewhat elaborate pipe unions of the Wellesley.

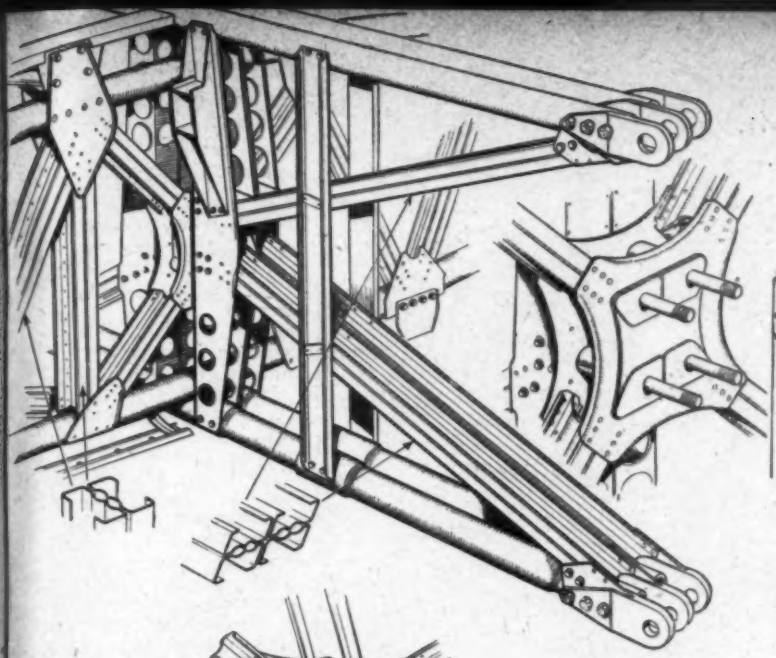
The geodetic panels of the fuselage are of very large size. It is almost literally true to say that the complete top decking, for example, is a single panel except that where great changes in contour occur (such as at cockpit openings) the large panel is interrupted. The method is seen again in the sides, which consist of three panels: a medium-size one in front, a small one where the central wing spar passes through the fuselage, and a very long panel from there to the rear gun position.

In production this scheme has considerable advantages. The two main spar frames, of which more anon, are set up in the jigs, the tubular longerons are located accurately in the jigs, and the panels of sides, top and bottom are dropped on to the longerons, and the whole bolted up. The fuselage primary structure is then complete, and is taken from the jigs and supported on jacks and/or trestles while the equipment is installed and the covering put on.

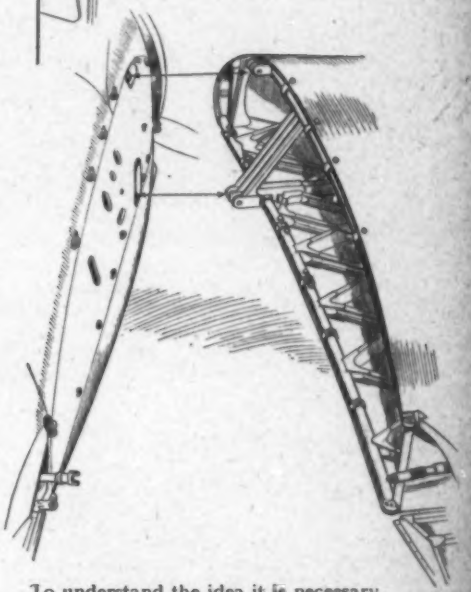
This particular form of production would have been rendered somewhat difficult if the nodal points of the geodesics had met on the longerons, as rather complicated joints would have been necessary. To overcome the difficulty the panels of top and bottom deckings are staggered in relation to those of the sides, so that the ends of the respective geodesics can be (and, indeed, are) very simple forked joints. Theoretically, there may be some slight objection to this staggering, as offsets are introduced, but the loads are probably very small indeed, owing to the very geodetic principle by which the bars in tension relieve the loads in those which are in compression, so that the stresses in the

After removal from the jig the fuselage is placed on trestles to have the equipment installed. The two pictures show two stages in this process.

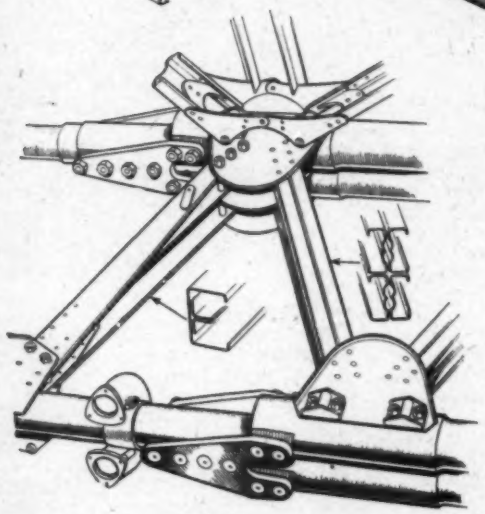




The main wing spar has tubular booms and channel-section braces. The joint between inner spar portion and the wing rib adjacent to the fuselage is made on the neutral axis and not at the flanges.

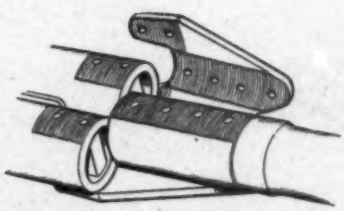


(Left) Details of spar construction: The spar has double tube booms in the inner portion and single tube in the outer.



(Right) The inner main spar passes through the engine nacelle, and supports it, and the spar of the outer wing portion is bolted to it inside the nacelle covering.

(Below) Serrated plate joints are used where the double-tube booms of the spar join the single-tube booms of the outer wing portion.



longerons, resulting from these offsets, are probably quite negligible. Certainly from a manufacturing point of view the arrangement is much simpler than that used in the Wellesley.

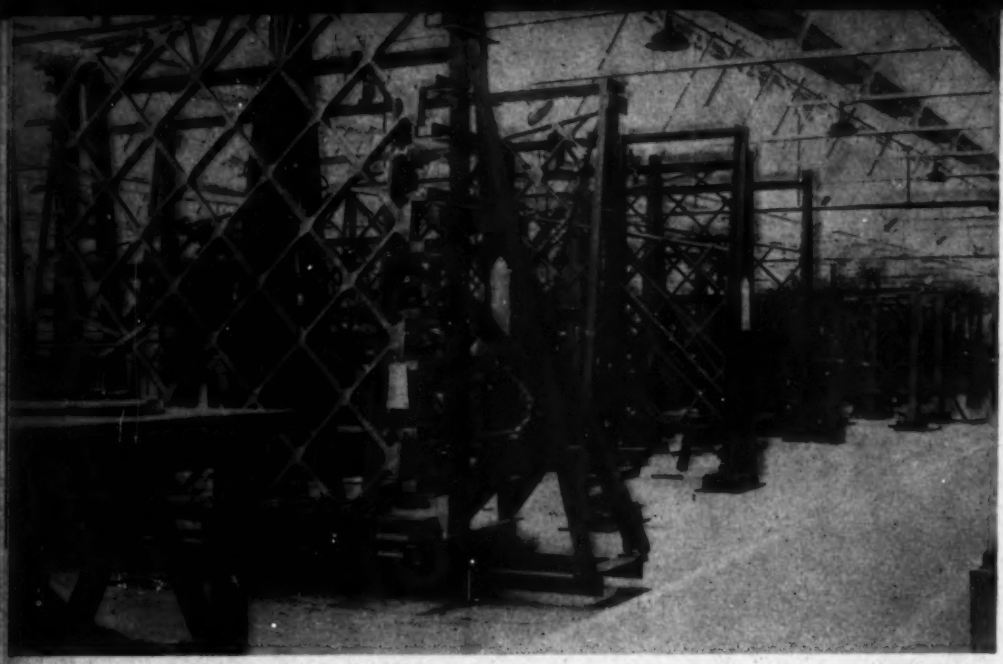
It is not, however, in the general scheme only that the Wellington fuselage differs from that of the Wellesley. The details themselves have been simplified considerably. Reference has already been made to the simple attachment of the geodesics to the tubular longerons. At the cross-over points, also, a different type of joint has been adopted. Where the two bars cross one another they are "halved together," as we should have said in the old days of wood construction, and the joint is made by "butterflies"—rather like wing nuts—at right angles to one another, and having a bolt through their centres; there are gusset plates on the outside. The sketch on page *d* shows the arrangement. The geodesics themselves are of different form, with "hollow-backed" channel sections in place of the plain straight-backed channels of the Wellesley.

It may be recollected that in the Wellesley one of the problems was to provide sufficient strength in the spar frames to resist the very high concentrated stresses transmitted from the spar flanges. In fact, these frames had to be so substantial that they weighed as much as the whole of the rest of the fuselage. In the Wellington a most ingenious arrangement has been adopted whereby the loads in the spar frames are greatly reduced, so that the frames can be made much lighter than they would otherwise be.

To understand the idea it is necessary to explain that the wing is of the three-spar type, with a single spar at the maximum depth of the wing section, and front and rear spars of much smaller depth at the leading edge and towards the trailing edge. The central spar passes right through the fuselage (actually it is joined on the centre-line) and "floats" in it without touching it. The front and rear spars are attached to the sides of the fuselage or, more specifically, to the flanges of the spar frames by a form of cardan hinge which gives free movement about a vertical and a horizontal axis. From this it will be obvious that the central spar, which carries the wing bending loads, transmits no stresses to the fuselage structure direct.

The front and rear spars, because of the cardan hinges, cannot transmit compressive loads arising from lift, but only those which are caused by wing drag, and which are relatively small. The wing lift is transmitted from the central spar to the front and rear spar root fittings and through them to the fuselage. The joint between main central spar and wing root rib occurs in the centre of the section, and not at the flanges, the tube of which, in fact, crosses those of the spar without touching them.

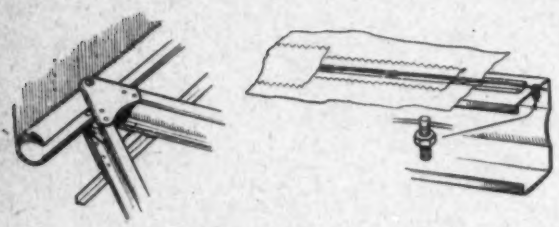
Although the spar frames have been relieved of loads in the matter just described, they still have to be of fairly substantial construction, as they do transmit the entire wing lift to the fuselage, and also serve as the basis for locating the whole fuselage structure. How the wing root fittings are attached to the flanges of these frames, and how the geodesics of the fuselage panels are secured to them, is shown in our sketches. Sheet-metal plates are first riveted to the flanges of those geodesics which cross the spar frames, and the plates are then bolted to the frames.



Panels of inner wing portion in their jigs.

Actually, there are 1,650, and they are all different. Storekeeping in particular must be attended with considerable care in order to ensure that the right bar always goes in the right place!

An interesting and really very simple system has been adopted for attaching the fuselage fabric. The details are shown in sketches. The main stringers have the fabric wired-on, but intermediate stringers, also of wood, are merely located by cord and not attached to the metal structure at all. When the fabric tightens up after doping there is, of course, no tendency for the fabric to come away, other than that caused by airflow. Presumably this is not sufficiently great to cause any trouble, as one does not notice the fabric "flapping" in the way it can with some forms of attachment. That it is indeed perfectly secure is shown by the fact that Wellingtons in service have been dived at about 300 m.p.h. without the fabric coming adrift.



In the Wellington the wing fabric is attached to the geodesics by bolts and wires.

In other words, the longerons are not attached to the spar frames direct, but via the geodesics. This arrangement results in very neat and simple joints. Except for the spar frames, and one or two others where local loads are heavy, all frames have disappeared from the Wellington fuselage.

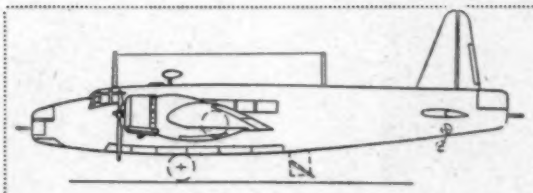
The straightforward geodetic arrangement is interrupted by the bomb bay in the bottom of the fuselage. For a distance of twelve feet or more the continuity is interrupted to give way to a flat raised floor above the bay. The amount of reinforcement that has been needed to carry the stresses past this break is really surprisingly small. The floor members themselves, by the way, are of the same geodetic construction as the curved panels.

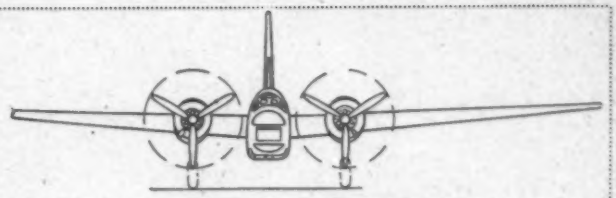
From the foregoing it may be gathered that the primary structure of the Wellington fuselage is very simple in its general theme, although the fact that the geodesics are of different lengths and different curvatures, according to their location in the structure, complicates matters somewhat.

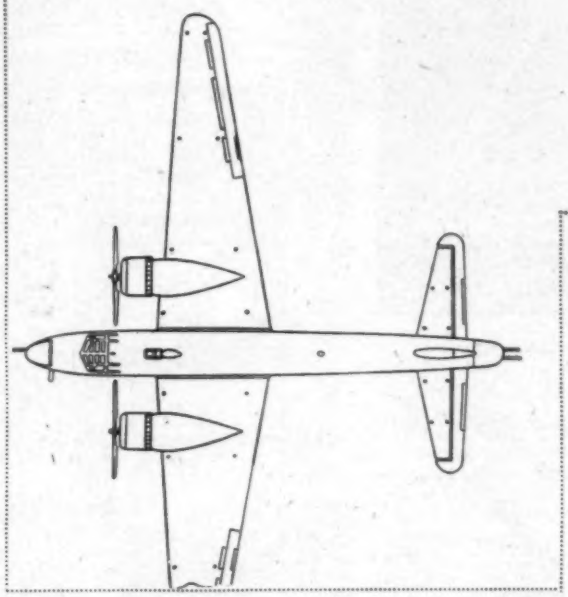
Three-spar Wing

Reference has already been made to the fact that the wing of the Wellington is of the three-spar type. The main spar is placed in the deepest part of the wing section, approximately on the centre of pressure, and is in the form of a girder, with tubular booms and channel-section bracing members. In the inner portion of the wing the spar boom tubes are in duplicate, but towards the tip this arrangement changes to a single-tube boom. The inner spar portions on each side extend from the centre-line of the fuselage (there is a joint here) to the outer face of the engine nacelle. From this latter point to the tip the spar is in one unit, although a joint occurs where the change from double to single booms takes place. The tubular booms are machined on their outer faces, leaving thick walls where the geodesics and certain other attachments are made, and a thinner wall in between. This type of spar boom, somewhat costly to make, is an example of the care taken in avoiding all unnecessary weight in the Wellington. It might be mentioned that when the materials manufacturers have perfected a system now being evolved, a tapered spar boom of extruded section will be

Inner main plane spar with wing root ribs. The spar booms are joined on the centre line of the fuselage.







VICKERS WELLINGTON I

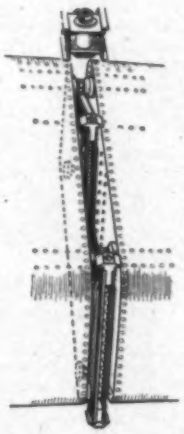
Two Bristol Pegasus XVIII Engines

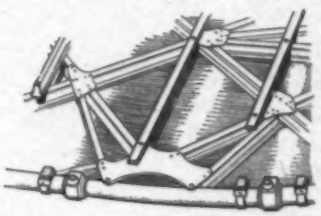
Span	86ft. 2in.
Length (guns extended)	64ft. 7in.
Track	20ft. 4in.
Wing area	750 sq. ft.
Wing loading	29·6 lb./sq. ft.
Normal gross weight	24,850 lb.
Top speed	265 m.p.h. at 17,000 ft.
Maximum range	3,200 miles at 180 m.p.h.
Service ceiling	26,300 ft.
Climb to 15,000 ft.	18 min.

used. The spar booms in each section are not necessarily continuous. Where joints occur they take the form of bolted plate joints, the plates and tube being serrated so as to relieve the bolts of the shear loads. A similar system was employed in the Wellesley, but there the plates were horizontal whereas in the Wellington they are vertical.

Front and rear spars are of a totally different construction. They have webs of flat sheet and flanges or booms in the form of "open" tubes, as shown in one of the sketches. The use of this open tube greatly facilitates attachment of geodesics and other members.

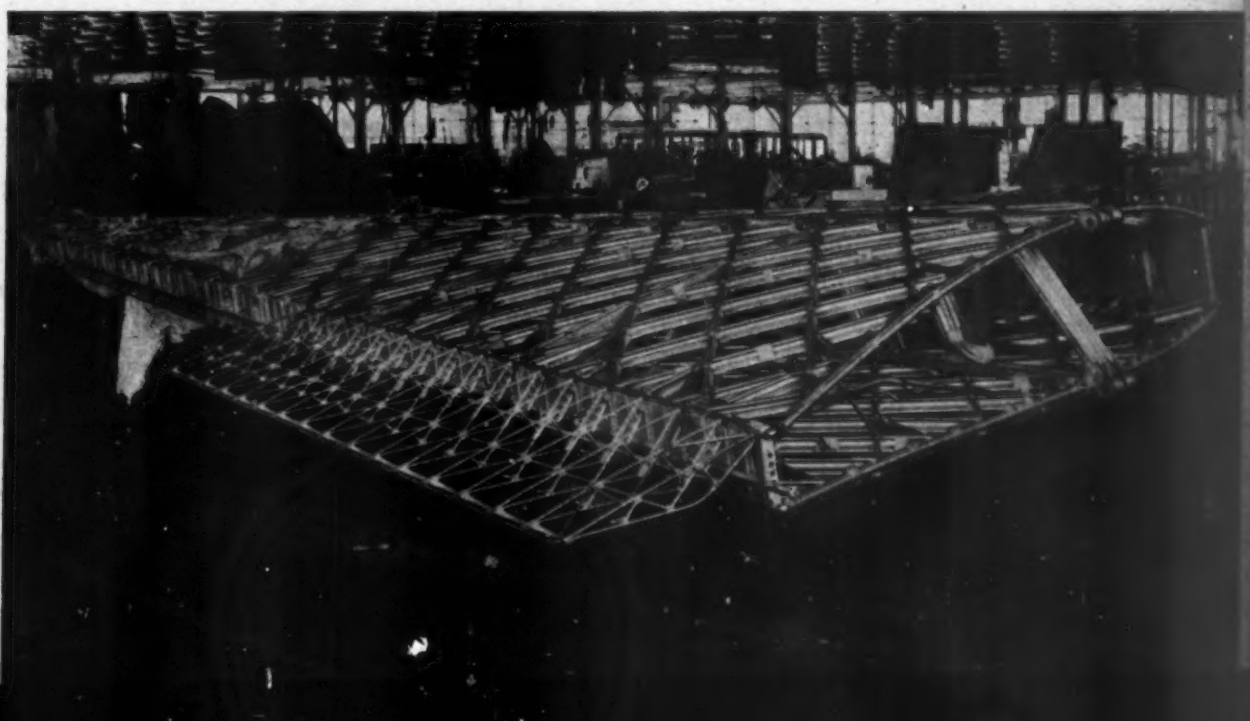
As in the case of the fuselage, the wing panels are made up in jigs and are of large size. They are attached to the centre spar booms by means of forgings, and to the open tube booms of front and rear spars by simple fork ends. The fabric is attached to the flanges of the geodesics by

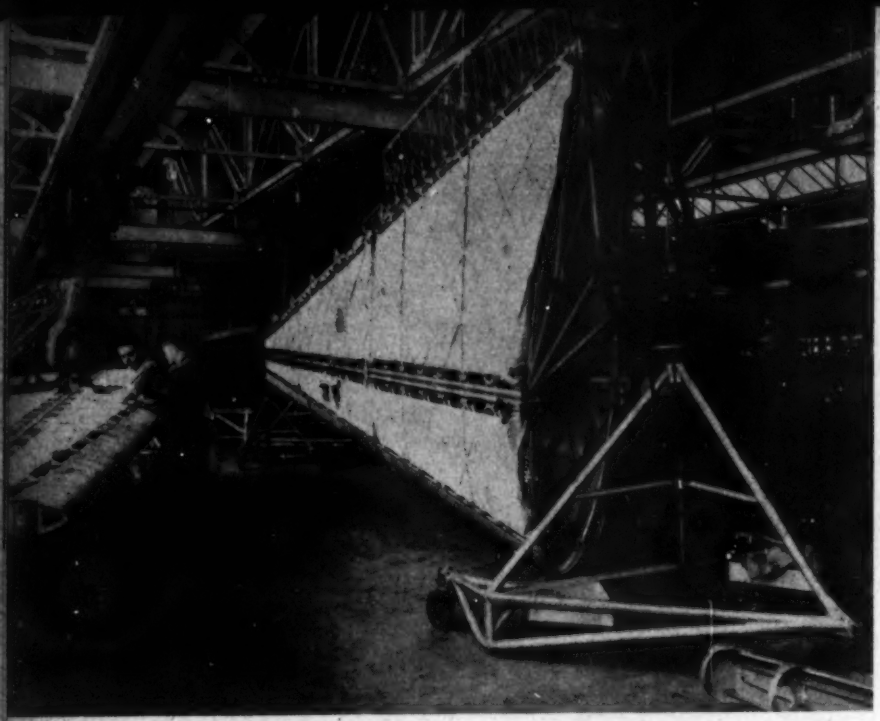




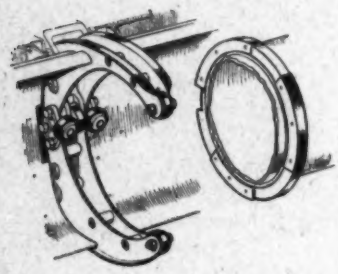
The fuel tanks are carried in the wings of the Wellington. They are built in sections, connected by Silentbloc joints. The wooden rails facilitate sliding the tanks into the wing. Connections between tanks are made by flexible tubes.

A port outer wing portion ready for covering with fabric.

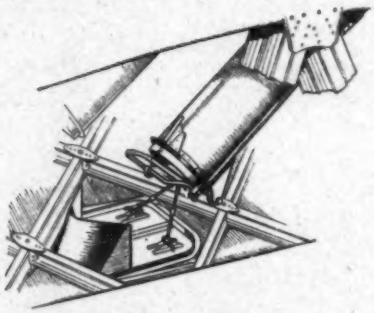




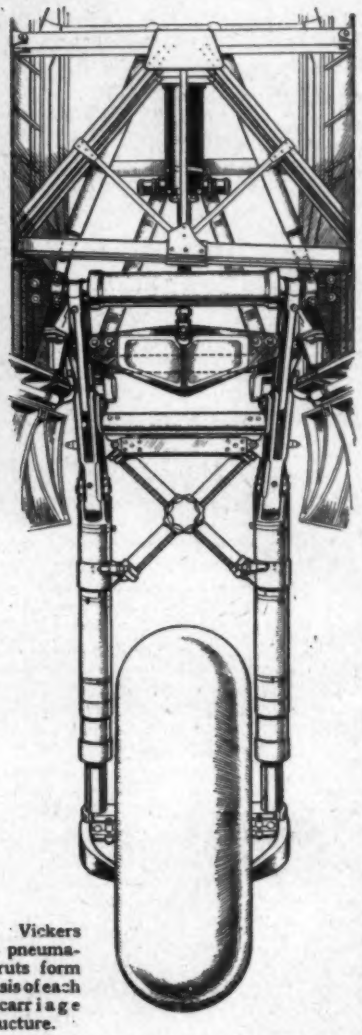
The use of jacks and trunnion mountings facilitates moving the wings about and turning them over while the fabric is being attached.



The elevator tube runs on rollers carried on "horseshoes" on the tailplane spar, instead of the more orthodox hinge arrangement.



Landing-flare chutes (with automatically opening doors) are installed in the wing roots. Parachute reconnaissance flares are released through a chute in the side of the fuselage.



Two Vickers oleo-pneumatic struts form the basis of each undercarriage structure.

wires on top of the fabric surface, these wires being threaded through holes in small bolts, as shown in a sketch.

The mounting of the petrol tanks inside the wing provided something of a problem, owing to the considerable length of tanks involved. In the end a system was evolved which has proved satisfactory. The tank in each wing is divided into three independent units, mounted in the wing with single spigots at each extreme end, and with four rubber trunnion mountings between adjacent tanks. Each tank is connected to the next by external flexible pipes.

What made the problem difficult was that it was not desired to cut into the geodetic wing construction, as this would have involved considerable weight, with openings for the tanks. Instead, the tanks are slid on wooden rails into the wing and fastened there. From this it follows that to remove a tank it is necessary to unship the wing.

At first sight it would appear that this was a bad feature in a military aircraft, the tanks of which might frequently get damaged. Actually, the outer wing portions are attached to the engine nacelles by 26 screws, which can be quickly dealt with by a brace similar to that used for removing the wheels of a car. By way of an experiment a wing was unshipped, the tanks changed, an A.I.D. inspection carried out, and the wing put back again ready for flight in three hours.

It is much to be regretted that details of certain tests made cannot be published. They relate to the extent to which the geodesics can be damaged without endangering the strength of the wing, and show some very good results. In this connection one may recall the "basket" masts used on certain ships of the United States Navy some years ago. Tests of these showed that a large number of the geodesics could be shot away without bringing the mast down. Similar results were obtained in tests on a Wellington geodetic wing. It seems almost impossible so to damage such a wing that the machine could not be flown home safely.

Dots and Dashes

"Learning Morse"; 6d. (*by post*, 7d.), *"The Wireless World,"* Dorset House, Stamford Street, London, S.E.1.

AIR Defence Cadets, Civil Air Guard members, and others in search of all-round knowledge, will find this handy little booklet valuable. It explains the correct technique of sending and receiving, gives instructions for making a practice buzzer set, and sets out the Morse code, the more common "Q," "QSA" and "RST" code signals, and lists international prefixes.

Dual—on Four Wheels

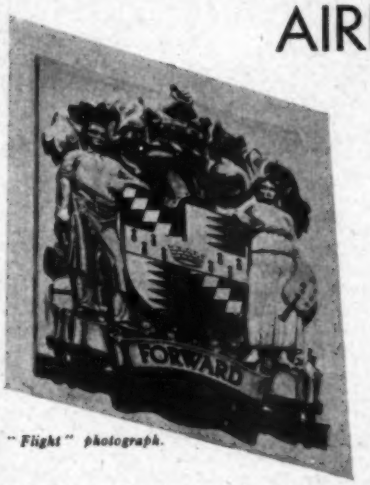
"'The Autocar' Guide for the L Driver"; 1s. (*by post*, 1s. 2d.), Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

WE will not offend the susceptibilities of the average *Flight* reader by suggesting that he does not know how to drive a car; but very probably he has friends or relatives about to take dual instruction on four wheels, and this little book is just the thing to help them, no matter how good the human instructor may be.

Making the Most of Previous Experience : A Compact and Attractive Terminal Building Design.

The approach from the road.

THE NEW BIRMINGHAM AIRPORT



"Flight" photograph.

APART from sheer ingenuity in design, which provides very spacious accommodation in a building which does not outwardly appear to be particularly large, the most interesting feature of the terminal building at Birmingham's Elmdon Airport—to be opened next Saturday by H.R.H. the Duchess of Kent—is the way in which facilities for the general public have been offered without interfering with the normal work at the airport.

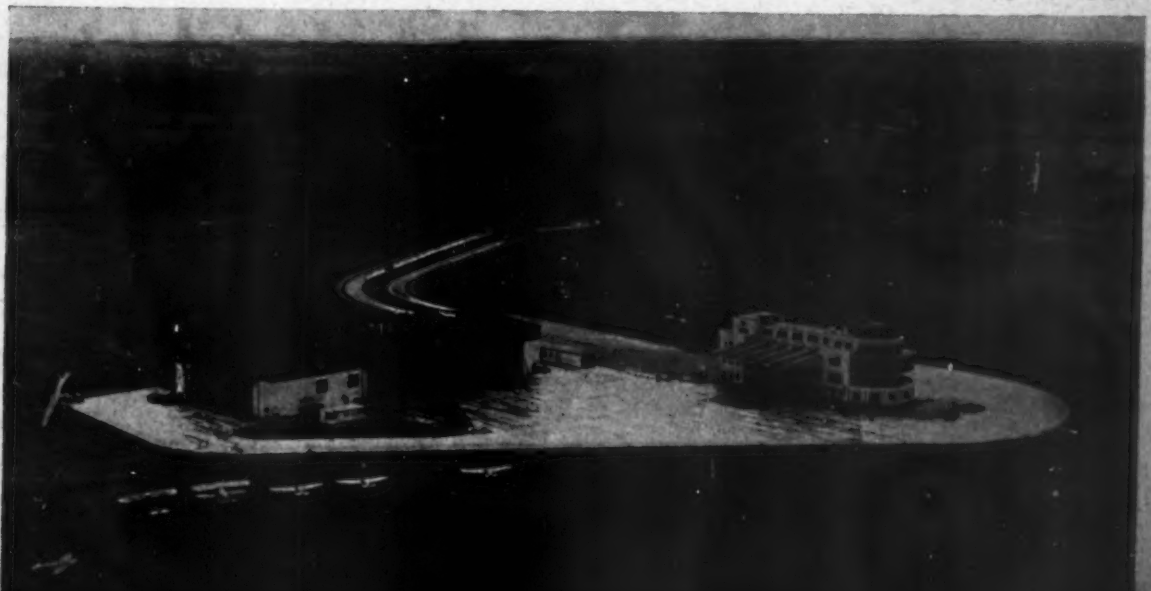
This careful consideration of the often-forgotten public may possibly have been the result of the tour around many of the European aerodromes made by members of the Airport Committee before work was started. At any rate, the Birmingham Council has decided that flying, and air transport in particular, must be "sold," and they have set about the business of encouraging ordinary people to visit the airport and watch what is going on. At the moment there are twelve airline services in and out, but there is also a Reserve school (which will be considerably extended during the next year or so) as well as the Midland Aero Club which, by now, will have transferred its headquarters from Castle Bromwich. Even without any flying, and on days when flying is necessarily restricted, there should be ample inducements for visitors.

Nor do the terminal building, or the single hangar which has so far been built, dominate the local landscape—in fact, when approaching the aerodrome from the south by air, only a considerable area of greensward can be picked out, the buildings, which are grouped on the southern boundary, being effectively hidden by a wood. From the main Coventry-Birmingham road, which joins the site, just enough is seen to intrigue, and not so much that any jaundiced person can complain of the way in which civilisation is upsetting the amenities of the countryside. While in the vicinity of the aerodrome, in fact, it is very hard to realise that the airport is only seven miles from the City centre.

Briefly, the airport building, which was designed by Norman and Dawbarn, can be described as a four-storey affair in which provision has been made for covered loading of aeroplanes by the use of balanced cantilever canopies. These canopies, which have a fifty-foot overhang and a

The building seen from the air, looking south-west. A second hangar will later be built.

"Flight" photograph.



FROM the CLUBS and SCHOOLS

LONDON.
THE flying time for last week amounted to 151 hr. 30 min. Miss P. Helmore, Messrs. T. Starr, S. Clinch and F. R. Crossley went solo. Messrs. J. W. Boote and C. M. Beavis have joined the club as new members.

SOUTH COAST.
Capt. Harold Balfour, M.P., paid a visit last Saturday to the club and inspected a parade of C.A.G. members.

YAPTON.
Over 150 hr. were recorded by members of the club and its C.A.G. section. There are now 32 members of this section flying solo.

WITNEY.
Flying time for last week amounted to 100 hr. 15 min. and for the month of June, 291 hr. 50 min. Mr. C. F. Callender has gone solo.

REDHILL.
A total of 141 hr. 30 min. was recorded last week. On Sunday a "dawn patrol" was held, in which only five machines penetrated the home defences.

HORTON KIRBY.
Last week 155 hr. were flown by the club. Miss C. Murray, Messrs. G. H. MacLellan, G. W. Berry, D. J. Devlin and N. R. Ralph went solo.

NORWICH.
Club and C.A.G. pupils logged 58 hr. last week. On Saturday afternoon Sir W. Lindsay Everard, the C.A.G. Commissioner for the Midland area, visited the club.

BROOKLANDS.
Bad weather reduced flying time to 76 hr. 10 min., but night flying amounted to 10 hr. Messrs. Beattie and Watson and Cdr. Addis have joined as new members.

DONCASTER.
Total flying time for last week was 43 hr. 55 min. Strong winds and rain made flying impossible on three days. Messrs. Carr, Auckland and Kiddle carried out their first solo flights.

LINCOLNSHIRE.
Although there was no flying on two days of the past fortnight, 159 hr. was recorded. Mr. E. L. Galley has joined the club as a new instructor. Forty-two licences have now been obtained.

THANET.
Although four days of the week ended June 26 were unsuitable for flying, 89 hr. were recorded. Mr. J. Maghan has gone solo. The club has accepted delivery of a new De Havilland Tiger Moth.

NORTHAMPTONSHIRE.
In spite of unfavourable conditions during the past few weeks a steady average of flying time has been maintained by the club's aircraft. Messrs. H. Swannie and J. W. Tomkins have joined as new members.

EXETER.
Three days of bad visibility reduced flying activities for the week ended June 26. In spite of this 91 hr. were flown. Messrs. D. F. W. Parish, E. C. Cruttendon and J. H. Blackhurst have gone solo. Messrs. K. Collins and G. B. Davie are to lecture C.A.G. members on navigation and meteorology respectively.

ISLE OF WIGHT.
Over 90 hr. were recorded last week. Miss P. Bullock, Messrs. N. St. J. Jacobs, J. W. Alderslade, P. H. Knowler, V. W. G. Turner, G. H. Chamberlain, C. H. Holden, W. J. Mair, J. F. Hay, M. F. Thatcher, P. C. J. Whelan and K. Bouskill have gone solo.

HANWORTH.
Flying time for week ended July 1 amounted to 175 hr. Messrs. R. E. Payne, R. A. Restall and H. Tongue (junior) have gone solo.

PORTSMOUTH.
Sixty members of the C.A.G. section are now flying solo. A successful monthly dance was held recently in the club lounge and was enjoyed by all those who attended. The total flying time for last month was 186 hr.

MARSHALLS'.
Over 144 hr. were logged during the past week. Messrs. W. E. Rand, J. Gallyon, H. J. Sanderson, P. J. Adshead and A. D. Shuckburgh have gone solo. The C.A.G. unit was inspected by Sir Lindsay Everard.

WESTON.
During the week ended June 26 there were two days which were unsuitable for flying, but in spite of this 37 hr. were recorded. A new De Havilland Tiger Moth has been delivered and will be used for advanced aerobatics.

WEST SUFFOLK.
During last week 45 hr. were recorded. Mr. F. O. Steed has joined the club, while Messrs. Bradnam and W. London have joined the C.A.G. section. This section was inspected by Sir Lindsay Everard last Saturday.

IPSWICH.
During the week ended June 26, 82 hr. were recorded. Messrs. E. Wells and D. Sutherland have gone solo. Short parades for C.A.G. members are held on Tuesdays at 7 p.m. They are followed by lectures or signalling exercises.

LANCASHIRE.
During last week 63 hr. were flown in the club's aircraft. The first of the club's two De Havilland Moth Minors has arrived and has been put through its paces by Chief Instructor Woodward and his new assistant, Mr. H. C. Richardson.

PLYMOUTH.
Thunder storms, high winds and bad visibility reduced flying time for the week ended June 26 to 78 hr. Mr. M. G. Gladwell has gone solo. Messrs. C. R. Holeman and Pearse are to give regular Sunday lectures to the local A.D.C.C. squadron.

BEDFORD.
A detachment of the C.A.G. section attended a National Service parade in Hyde Park last Sunday. Incidentally, the section was inspected by Sir Lindsay Everard and Sir Francis Maclean last week. Messrs. H. W. Holland and D. Thomas have gone solo.

CINQUE PORTS.
Adverse weather conditions hindered flying during the week ended July 1. However, the total recorded was 86 hr. Messrs. Prevett and Brockway, of the C.A.G. section, went solo. Visitors to the club this week included Miss Jean Batten, Mr. Sharwood-Smith, and Captain Duncan Davis, and members of the Brooklands Flying Club.

Overseas

PENANG.
Flying time for May showed a slight decrease due to a falling-off in cross-country flying. The total flying time for that month was 199 hr. Mr. J. B. M. Messer won a landing competition organised by the Jendarata Flying Club.

JOHANNESBURG.
During May a total of 676 hr. was recorded. Four of the club's aircraft took part in the Maritzburg Air Rally and a similar number of aircraft took part in the annual cruise to Victoria Falls. Members of the club also attended an Air Rally at Randfontein.

Exports Rise

FOLLOWING a record year in 1938, when exports of British aircraft, excluding Government-owned stores of aeroplanes, engines, armament and equipment sent to R.A.F. squadrons overseas, amounted to £5,409,000, a still greater increase in export values is indicated by figures issued for the first five months of 1939.

The aggregate for this period is £2,731,682, compared with £2,371,941 and £1,162,509 for the corresponding periods of 1938 and 1937 respectively.

Military aircraft exported under licence and with the full approval of the Air Ministry include Hurricanes to Belgium, Jugoslavia, Canada and South Africa; Blenheims to Finland, Turkey and South Africa; and Gladiators to Portugal and Norway. Portugal is now negotiating for the purchase of Spitfires. Greece has acquired some Ansons, and Swedish Air Force pilots recently came to England to collect a Hampden. New Zealand has received Oxfords and has ordered 30 Wellingtons; and three Sunderlands will go to Australia in September. Among civil types, De Havilland machines went to twenty-eight different countries last year, and the Percival Q.6 has found markets in Australia, Lithuania and elsewhere.

A.D.C.C. Progress

THE Air Defence Cadet Corps is now 152 squadrons strong. With an establishment of 100 cadets to each squadron, this will mean a total of 15,200 when the new squadrons are up to strength, apart from the new units being formed every week. The movement now has its own *Gazette*, published monthly at 2d., in which the formation of new squadrons and other news is recorded.

Charing Cross—R.A.F. Station

OF the many publicity displays which have been staged at Charing Cross Underground station, we have never seen one that has attracted such crowds as that which is occupying the space at present. But seldom can the exhibits have been as striking as those now on view—a real, complete Supermarine Spitfire, a Pegasus engine, and a sectioned Merlin. With aircraft models and photographs in addition, and personnel to answer enquiries, the Royal Air Force should find this one of its most successful recruiting efforts.

The exhibition, which was opened by Capt. Harold Balfour last Friday, remains open until July 27.

FOR FELIXSTOWE TESTS: The Consolidated Model 28-5 flying-boat which will shortly be delivered to Felixstowe from San Diego via Botwood, Newfoundland. Botwood will be the only stop, though the total distance will be 5,750 miles. The engines are Twin Wasps and the machine bears the British Service registration P.9630.

HERE and THERE

Lost and Regained

DURING the past fortnight the British gliding record for altitude has twice changed hands. On June 22, Mr. N. McClean, of the Newcastle Gliding Club, rose 10,540 feet in a Grunau Baby sailplane by flying in the "Helm Wind" on the lee side of the Pennines near Cross Fell. He used the so-called "lee wave" which is believed to be caused by air which, after descending in the lee of a mountain, rebounds up again in a series of waves. German sailplane pilots have set up several altitude records in the last few years by utilising similar phenomena, which occur only in certain atmospheric conditions; the Germans' greatest height is 30,180 feet above sea level, achieved in a *Foehn* wind blowing off the Alps. Mr. McClean's rate of climb was over 40 ft./sec.

Mr. Philip Wills, who previously held the British record with 10,080 feet, has lost no time in regaining it, for last Saturday, July 1, after a launch in his Minimoa sailplane from Dunstable, he plunged into a towering mass of cumulus over Luton and in 15 minutes rose from its base at 3,200 feet nearly to its top, where he emerged at 14,200 feet, to find the earth entirely blotted out by cloud. He soon found his bearings over St. Albans and scraped back to Dunstable with 200 ft. to spare, having been up 2¼ hours altogether. At one stage of the climb the Minimoa gained 1,100 feet in only 30 seconds.

On the same day Mr. G. H. Stephenson, of cross-Channel fame, took his Kirby Gull sailplane into a neighbouring cloud, but the lift died out when he had climbed to 7,000 feet.

Mr. Philip Wills (with special altitude-rated hat) in the somewhat confined quarters of the Minimoa.

The Civil Aviation Benevolent Fund

THERE was a time when an aeroplane pilot was a comparative rarity. Only seven years ago there were only about 6,000 British licensees all told. Commercial licences totalled under 1,000. At that time many pilots were still part of the overflow of ex-war pilots who had taken up aviation after the conflict with many hours but little experience of organised navigation and scheduled time tables. In the intervening period a new type of specialist has emerged, and he is the present-day commercial pilot who had to go through an intensive and expensive form of training to fit him for the responsibility of flying airline passengers in comfort and safety. His numbers are increasing every day. The commercial pilot, also, apart from the airline man, is now very busy with the small companies doing charter work and Army and Navy co-operation, both by day and night; nor must one forget the all-important flying instructor.

Up to the present, mainly owing to the speed at which aviation has progressed in this country, there has been no organised attempt to safeguard these men and their dependants. The new Civil Aviation Benevolent Fund hopes to raise at least £100,000. Several thousands have already been subscribed.

As part of a big new "drive" for the Fund, a special illustrated souvenir book is being produced, containing articles by well-known authorities on a number of different aspects of flying. Capt. Norman MacMillan is the honorary editor. There are two editions—a 7s. 6d. version for limited circulation, and a popular 2s. 6d. edition.

In addition, as already announced, a special flying display is being held in aid of the Fund at Redhill Aerodrome on July 29. The hon. organiser of the Fund is Mr. F. W. Farey-Jones, F.R.S.A., Room 172, Airport of London, Croydon, from whom copies of the book will shortly be obtainable.

From A to Z

"How to Become an Air Pilot," by Capt. R. L. Preston, A.F.R.Ae.S., and Sqn. Ldr. E. H. D. Spence, R.A.F.O.; 3s. 6d., Sampson Low.

THIS, the seventh revised edition of a well-known work, contains full details of the Civil Air Guard scheme, and chapters on "Flying Instruction," "The Royal Aero Club Certificate and the Air Ministry 'A' Licence," "The Technical Examination," and information on air touring and gliding, much of which is not found in other similar publications designed to assist the beginner. The technical examination is very fully treated and there is an enlarged insert in colour giving the signals used at civil aerodromes and the standard method of civil aerodrome marking.

"S. of S." Among the POWER BOATS

SIR KINGSLEY WOOD could be forgiven if by this time he had become somewhat blasé about masterpieces of engineering, but there was no doubting the sincerity of his interest in the products of the British Power Boat Co., Ltd., when last week he inspected their works at Hythe.

After embarking in a Power Sea Coach at A.S.T. and streaking over Southampton Water in one of the new Scott-Paine 70ft. torpedo boats (three Rolls-Royce Power Merlins) to which he had transferred, he landed at Hythe in exceptionally high spirits to make the rounds of the works.

Mr. Hubert Scott-Paine piloted the distinguished "crocodile" of visitors with the same facility that he had displayed on the control bridge of the M.T.B. Apart from the Secretary of State for Air the party included Air Comdre. T. E. B. Howe, A.V-M. R. Williams and Sir Edward T. Campbell. The reception party included Mr. Hubert Scott-Paine, Mr. Stuart N. Barker, Vice-Admiral Sir Geoffrey Blake, Miss H. M. Dinkeldein and Mr. M. W. Wright.

As another visitor to the Power Boat works one could readily understand Sir Kingsley's enthusiasm. To give an indication of the extent of the factory one has only to list the departments visited. These were: engine shops, machine shops, wood-working shops, sawmill, paint and finishing shop, metal shop, pipe-bending department, chromium-plating department, engine test-rooms, erection shops, assembly shops, experimental department, stores, finished stores, raw-metal stores, timber yard, coppersmiths' shop, tank-making department, drawing office, slipways and launching shops.

Among the craft shown to Sir Kingsley were the imposing new 70-footers, the ocean-going aircraft rescue and patrol launch (which has been supplied in quantity to the R.A.F. and which is powered with three 500 h.p. Power-Napier Sea Lions), the target-towing launch with two Sea Lions, the armoured target boat with three 100 h.p. Power-Meadows engines, and the rescue and general service aircraft tender with a pair of Power-Meadows units. Incidentally, Sir Kingsley's visit almost coincided with an Air Ministry order for the hundredth boat of this type.

Before he left, amidst spontaneous cheers, Sir Kingsley Wood was presented with a scale model of a Rolls-Royce Power Merlin marine engine made by apprentices.

The Air Minister, after a run in a 70ft. torpedo boat, congratulates Mr. Scott-Paine.

Australia's Flying Doctors

THE current issue of *World Digest* contains more than forty features selected and condensed from the Press of this and other countries. The articles cover a very wide range from international politics to archæology, from psychology to personalities.

A particularly interesting article deals with the aerial medical services in Australia, an organisation which is carrying out magnificent work.

World Digest is a pocket-size, sixpenny monthly published by the Amalgamated Press. Although only in its fourth issue, it is established as the best publication of its kind.

CONTRIBUTORS to the WELLINGTON

AMONG the firms supplying components, accessories, materials and equipment for the Vickers Wellington (Bristol Pegasus XVIII engines), described in detail in this issue are:—

AEROLEX, LTD.—Bomb beam tooling and machining, oleo pump assembly, wing struts, etc.

ALLTOOLS, LTD.—Fabricated fixtures for wing and fuselage assembly, jig boring, jig designing.

JAMES ARCHDALE AND CO., LTD.—Pillar drills.

ARNOTT AND HARRISON, LTD.—Special tooling equipment, jig fixtures and press tools.

BEARD AND FITCH, LTD.—Internal bevel gears, worm wheels and clutch gears.

D. H. BONNELLA AND SON, LTD.—Electrical apparatus and accessories.

JAMES BOOTH AND CO. (1915), LTD.—Duralumin and other light metals.

BRITISH PRESSED PANELS, LTD.—Pressings.

BROWN BROTHERS (AIRCRAFT), LTD.—A.G.S. parts.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.—Electric cables.

CELLON, LTD.—Protective finishes.

CRAMIC ENGINEERING CO., LTD.—Hydroptic jig boring, jig and tool work.

DE BERGUE'S PATENTS, LTD.—Tank rivets.

DESOUTTER BROTHERS, LTD.—Pneumatic tools.

R. K. DUNDAS, LTD.—Sheet metal work, welding, machining and metal spraying.

WILLIAM EDGAR AND SON, LTD.—Small dural and mild steel parts.

FAULKNERS, LTD.—Drop forgings.

C. & J. FITZPATRICK AND CO., LTD.—Bevel gears.

FOLLAND AIRCRAFT, LTD.—Bomb beams, etc.

SAMUEL FOX AND CO., LTD.—Fox electric steel for airscrew and undercarriage mechanisms.

GALLAY, LTD.—Boilers and cabin heaters.

HELLIWELLS, LTD.—Fuel tanks and bomb beams.

HIGH DUTY ALLOYS, LTD.—Hiduminium R. R. alloys.

H. M. HOBSON (AIRCRAFT AND MOTOR) COMPONENTS, LTD.—Hobson master control carburettors.

HOFFMANN MFG. CO., LTD.—Bearings.

J. L. JAMESON, LTD.—Jigs, tools, gauges, etc.

JOHN F. KENURE, LTD.—Detailed fittings and machine parts.

JOSEPH LUCAS, LTD.—Electrical accessories.

MACROME, LTD.—High speed carbon cutting tools

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Ignition harness

MOLLART ENGINEERING CO., LTD.—High load capacity universal ball joints.

MORRISON'S ENGINEERING, LTD.—Wing tips and other types of sheet metal work.

REDWING AIRCRAFT CO., LTD.—Ailerons, pilot's frames and floor, minor assemblies, etc.

REID AND SIGRIST, LTD.—Reid and Sigrist instruments.

ROLLASON AIRCRAFT SERVICES, LTD.—Tail units.

L. A. RUMBOLD AND CO., LTD.—Upholstery.

SANDERSON BROTHERS AND NEWBOLD, LTD.—Electrically melted steels.

VOKES, LTD.—Air and oil filters.

WEATHERSHIELDS, LTD.—Screens and hoodings.

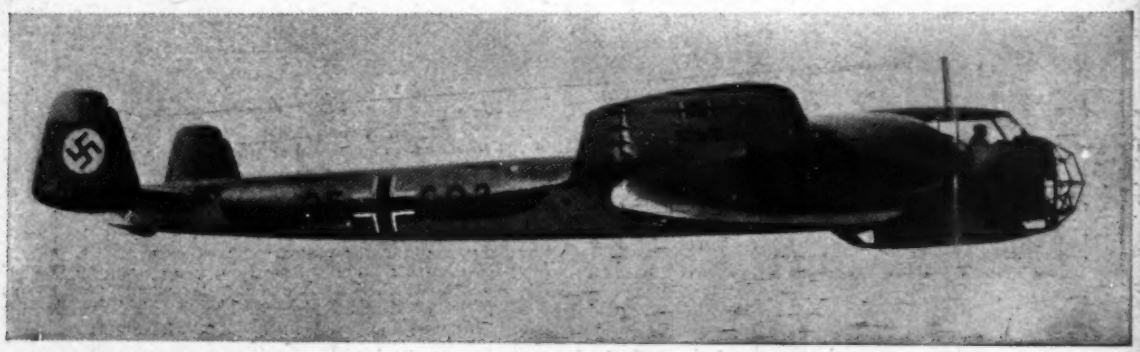
W. & A. WILLIAMSON, LTD.—Main fuel, long range and oil tanks.

WILSON AND KYLE, LTD.—Tools, jigs, special parts.

WINDOVERS, LTD.—Tubular MG.7 seats.

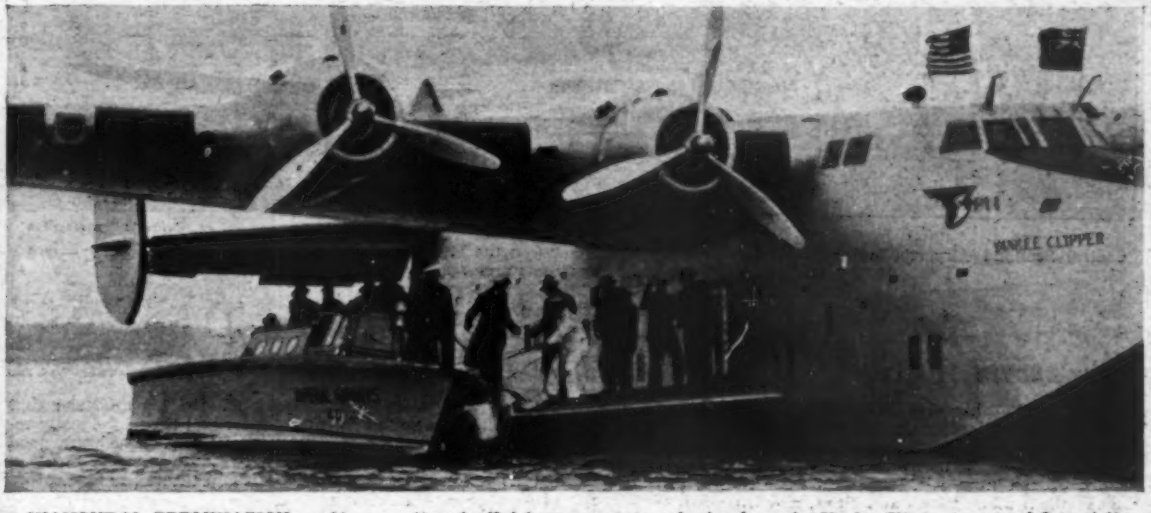
WORCESTER SHEET METAL CO.—Main fuel and long range tanks, oil coolers and tubular seats.

YORKSHIRE ENGINEERING SUPPLIERS, LTD.—"Eatonia" cast phosphor bronze and gun metals.



A DORNIER DEVELOPMENT: The Dornier Do. 215 which has been developed from the Do. 17 and is said to be faster.

COMMERCIAL AVIATION



INAUGURAL TERMINATION : "Observers" and official passengers transferring from the *Yankee Clipper* to one of Imperial's Power boats after arrival at Hythe at the conclusion of the first regular mail service across the North Atlantic.

THE WEEK AT CROYDON

Captains Collegiate and Pilots Paternal : Ensigns Over the East : Why is a Fox when it Flies? : Back to Montgolfier—or Nearly

I HEAR that Captains Horsey and Bailey of Imperial Airways are now permanently off air-route work in order to take charge of flying instruction of the company's pilots and crews. Horsey will be at Croydon and Bailey at Hythe. Crews—mainly from the East who have been flying Hannibal and Atalanta types, will be trained on Ensigns here at Croydon. This is quite probably the beginning of something big in British Civil Aviation; it may even develop, in years to come, into a sort of commercial Cranwell.

Captains Horsey and Bailey were the first two commercial pilots in Great Britain to obtain commercial tickets for marine aircraft and they both came to Imperials in 1924 from the British Marine Navigation Company. Horsey has spent 14,000 hours in the air and his mileage is about 1½ millions. Bailey has over a million and a quarter miles to his credit and has flown for approximately 11,000 hours.

A fourth "E" class aeroplane has arrived at Croydon —*Elysian* by name, sister ship to *Empyrean*. It seems that six Ensigns are earmarked for European use and that eight others are being equipped with Cyclone motors for use in the Imperial Airways landplane service between Alexandria and Calcutta.

Flying Foxes Fly

An amusing situation developed at Croydon last week when a company imported a number of live flying foxes. Now, the duty on birds is higher than on quadrupeds, for some obscure and intricate reason (or, quite probably, from complete lack of reason). Customs tried to say that the flying foxes were birds, because they flew, but the importer pointed out that they had four legs. Customs, after consulting zoological experts, concluded that having four legs was synonymous with being a quadruped, but they were still worried because the things flew. (Incidentally, they don't, but merely glide from tree to tree with a rather alarmingly high wing loading.) Heaven help all concerned if a duck-billed platypus ever lands here, for it lays eggs and is amphibious. Customs would probably class this creature as smuggled opium and fine everybody heavily before handing it over to the public executioner for destruction. If a flying biped has to pay higher duty, what about parachutists and where does one stand with bats? Moreover, would a flying fish be a bird according to H.M. Customs and Excise (whom Heaven preserve)? It is indeed fortunate for the importer of antique furniture that an occasional table is undeniably a quadruped. [Unless it is a gate-leg affair with six legs, when it presumably becomes an insect.—ED.]

You wouldn't believe such nonsense, unless you knew that chocolate coins covered with gold foil had once been solemnly seized by Croydon Customs as contraband and that customers are required to certify that an Early Ming vase is over a hundred years old.

Some time back, Capt. Carl Florman, Director of Swedish Air Lines, remarked that the best civil pilots were married men with children. Several senior pilots looked thoughtful at the time and now, behold, three of them have paraded in full uniform each with an offspring in his arms at the Bromma Church, near Bromma Airport, Stockholm, where there was a triple christening. The names of the pilots are Sven Ahblom, Hjalmar Bosson and Ernst Roll. That's the spirit!

I happened to come across a copy of *Flight* for October, 1921, when rummaging in remote places for a missing collar stud. Several interesting items appeared; for example, there is mention that Mr. O. P. Joncs, of the Berkshire Aviation Co., flying an Avro to Ostend, had to turn back to Lympne through petrol trouble. Other names of old-timers cropping-up casually are those of M. Bouderie, of "Grands Expresses Aeriennes" and Capt. Leverton and Mr. George Young, of K.L.M. Capt. Smirnoff is recorded as flying a D.H.4 from Brussels to London for S.N.E.T.A., the Belgian company which preceded S.A.B.E.N.A.. It must have been quite soon afterwards that Smirnoff joined K.L.M. Capt. Olley was then flying for K.L.M.

One of the K.L.M. inward Douglas D.C.3 machines on June 29 had the following passengers on board: Three from Amsterdam, one from Copenhagen, two from Stockholm, six from Frankfurt, one from Cologne, one from Bagdad, three from Karachi, one from Calcutta, one from Allahabad, and one from Batavia. A load representative of what civil aviation can do to bring people together.

A. VIATOR.

"Flight" photograph

Central Scotland Airport's building layout, with the terminal between the two large hangars—a picture taken shortly before the opening ceremony, while the guests and visitors were indoors.

SERVING CENTRAL SCOTLAND

Grangemouth Airport is Officially Opened by Lord Trenchard : Rapid Development

SOMETHING like five hundred guests, the majority of them capable of being described by the customary word "distinguished," were present at the official opening last Saturday of the new Central Scotland Airport at Grangemouth. Apart from representatives from the Services, from the various Scottish towns and cities, and from British airline operating companies, there was also a strong contingent from Holland, led by Mr. A. Plesman, the managing director of K.L.M. He came over in a D.C.3, and the machine later flew on to Prestwick, the headquarters of Scottish Aviation (the company behind the Grangemouth project), and then, on Sunday down to Birmingham and up to Manchester and Liverpool for the operation of the regular North of England service.

This K.L.M. visit was one of the more interesting features of the airport opening day, particularly as there is a very good chance that K.L.M. may, next year, be running a direct service from Amsterdam to Grangemouth in order to give business people in Scotland the same opportunities which are at present offered to those in the North Midlands.

Before the luncheon there was a preliminary opening ceremony. Lord Trenchard spoke briefly of the record time in which the aerodrome had been constructed, of its national importance, and of its primarily civil interest, and the moment of the official opening was signalised by the firing of a smoke bomb, at which a flight of Harts took off from the aerodrome and flew over the terminal building.

News in Speeches

The main features both of the aerodrome and its history were explained in the various speeches which were made after the official luncheon. This was held in one of the two big hangars, and was presided over by Lord Nigel Douglas-Hamilton, who is one of the directors of Scottish Aviation.

After welcoming the guests, and before introducing Lord Trenchard, Lord Nigel Douglas-Hamilton said that though he regretted the delay in establishing a civil aerodrome to serve the east of Scotland, this delay had not been without advantage, because during the last fifteen years the requirements of civil aviation had increased far more than was anticipated.

For some time negotiations had been in progress with the Edinburgh Corporation, but it became clear that Air Ministry requirements could not be met by the original plan, and in January Scottish Aviation submitted the Grangemouth scheme to the Air Ministry as a private venture. On February 2 the plans were approved, and four days later the work was put in hand. By April 16 North Eastern Airways were able to initiate their summer services, using this centre.

To-day the guests could see what was tantamount to the first development scheme, which had reached maturity in less than five months, this giving a minimum runway of 1,300 yd. and a maximum of 1,500 yd. These figures could be increased to 2,000 yd. in all directions, with a bad-weather runway of as much as 2,700 yd. The latter also offered a clear seven-mile approach from the sea. He hoped that the Lorenz system would presently be available, but in the meantime medium-wave D/F was being installed. The company hoped eventually to be able to install lighting facilities, so that the projected night mail service between London and Grangemouth might be started, thus fulfilling a specific recommendation of the Maybury Committee.

The immediate use for the aerodrome was that of training the Royal Air Force Volunteer Reserve, for which a centre had been formed there for the east of Scotland. Training actually started on May 1.

Lord Nigel Douglas-Hamilton reminded his audience that the general location of the new airport had been specifically recommended by the Maybury Committee. There were good rail and road communications with the two largest cities in Scotland. In this connection he stressed the future importance of long-distance air services.

In his reply Lord Trenchard congratulated Scottish Aviation, and briefly described the features of the site before expressing the view that an airport was not, in his opinion, a financial proposition for a private company. Airports such as Grangemouth should be supported by the Corporations of the towns in the vicinity. He understood that meetings were already taking place to discover whether such an arrangement could not be made.

He looked back on the day when we had, in 1918, the largest Air Force in the world, with 300,000 officers and men; even now we had only 200,000, including those in the Reserves. After seeing the Force of the war period reduced to practically nothing, we were now watching it gradually regaining its former strength. He referred particularly to the Auxiliary Air Force, which was well represented at the airport opening, and stressed the importance of Service morale, on which so much depended. He was a firm believer in the Air Force as an attacking rather than a defensive weapon, and was convinced that the greater proportion of our resources should be devoted to those weapons which would win a war rather than merely defend the country.

From the important civil point of view, he felt that a tremendous future lay ahead of the Central Scotland Airport, which would later prove to be a great national asset. By establishing such an airport it was possible to educate a large number of people in the advantages of air travel.

Air Marshal C. L. Courtney, A.O.C. of the new Reserve Command, proposed the toast of "World Aviation," and mentioned the names of the various distinguished visitors, including that of Mr. Plesman, who replied. The managing director of K.L.M. said that three years ago, when he first heard of an Edinburgh airport plan, he had asked his representative in the North of England to request the authorities of Edinburgh and Glasgow to get together and to establish an airport to serve both cities. He was, therefore, particularly glad to be present on this occasion.

Scotland—Holland?

After speaking of the salient principles and advantages of air services, Mr. Plesman said that the traffic on the K.L.M. North of England service had so improved this year, after nearly five years of effort, that he hoped that the service could from now on be continued during the winter months.

Other speakers were Mr. W. Y. Darling, Treasurer of the City of Edinburgh, and Sir George Stirling, Lord Lieutenant of Stirlingshire.

Remembering the short period in which work has been going on, the new Grangemouth aerodrome is certainly a remarkable achievement. More remarkable still, the buildings (two large hangars and a distinctly attractive and roomy terminal) are also ready—unusual enough on official opening days. At present the surface of the aerodrome is a little "ridgy" for light aeroplanes, but it should soon settle down, and the magnitude of the extension possibilities are obvious from the air. The site is only a very short distance from the Firth of Forth, which provides a wide, obstructionless approach of a virtually indefinite length—as well as an unfailing landmark for pilots of radioless machines, and trainees in particular.

CONFERENCE AT PERTH : Some of the delegates and others at Perth Aerodrome during the annual Aerodrome Owners' Association Conference there. In the foreground, left to right, are Ald. W. E. Wilford (Leicester), Lord Provost Nimmo (Perth), J. Ure Primrose (president of the Association) and Mr. Whitney Straight. Among those behind will be seen Mr. C. M. Newton (Sywell), Mr. A. R. Gillman (secretary) and Mr. R. Ashley Hall (Bristol).

AERODROME OWNERS at PERTH

THAT it should be made a hard-and-fast rule for air transport companies to land their machines at all scheduled aerodromes, irrespective of whether or not there are passengers to be picked up, was a point upon which strong emphasis was laid at the Aerodrome Owners' Association's summer conference in Perth on June 29. The meeting adopted a resolution that the Licensing Authority should make it a condition for granting licences that machines must do so.

The executive committee was instructed to urge the Authority to give individual notice to owners whose aerodromes are on the route of these services of the hearing of applications by companies for a licence. It was further decided that the association should be represented at the hearings by counsel.

During the discussion this "on demand only" practice was described as an attempt to queer the pitch of air travel. The companies objected to the money wasted on landing fees and, in addition, to the time lost. These objections the Association answered by claiming that landing fees were low for this service and machines lost just as much time in circling aerodromes at which they did not land.

On the position of those control officers who are at present employees of municipalities but whose salaries are refunded by the Air Ministry, the Association resolved that the executive should reconsider the question with a view to recommending the Ministry to assume complete responsibility. Urging recognition and established posts for these employees, Councillor J. Ure Primrose, the chairman, contended that it was unfair that they should not know from day to day how long their job was going to last. His fear was that the Air Ministry, having put sufficient control officers through their hands, were now going to substitute them for those in the service of municipalities. Mr. Robert Adam, Perth town clerk, described the present position as Gilbertian and unsatisfactory, and urged the Association to press for all control officers to be taken over by the Air Ministry. The meeting unanimously approved a motion on this matter.

On the question of the C.A.G., Mr. C. M. Newton, of Sywell, suggested that arrangements should be made between C.A.G. operators and aerodrome owners that payments be made on flying time. He moved that the executive committee should reconsider the question and give a lead to the members. Mr. Whitney Straight appealed to the Association for the reorganisation of landing fees, and Mr. Newton tabled a motion calling on the Air Ministry to expedite the order regarding the question of fees and charges. Unless they made a move on this matter it was likely to be prolonged for an indefinite period. Mr. Gillman, the secretary, pointed out that the Air Ministry had already made a move in regard to this question and they were likely to hear something very soon.

On the following morning an extraordinary meeting was called to discuss the British Overseas Airways Bill, which deals with the amalgamation of British Airways and Imperial Airways, and gives the Corporation powers to do practically anything they desire in Great Britain as well as abroad—buying and operating airlines and subsidising services, aerodromes, machines and accessories. Mr. Whitney Straight, explaining the Bill, said that a protest had been made against the operating of internal air lines by the Corporation. He suggested that the Corporation should confine its activities to the operation of Empire and overseas routes, and if they desired to work internal lines this matter should provide the subject matter of another Bill, in which the Association would have an opportunity of airing their views. Mr. Newton said the Bill was really a very serious thing and called for immediate action on the part of the Association. Councillor Johnson, Portsmouth, recommended the members to read Lord Hewitt's *New Despotism*, which dealt with much contained in the new Bill. He thought if the Bill went through in its present form it would prove disastrous to the Association.

The meeting passed a resolution endorsing the action of the Air Services Association in objecting to the operating of internal lines by the Corporation. It was agreed to call an emergency meeting of the executive committee to consider all clauses in the new Bill.

The Dinner

His Grace the Duke of Atholl was the principal speaker at a dinner in the Royal George Hotel, Perth, given to the delegates by Perth Corporation. In the course of his speech, he recalled a conversation he had had with the designer of the first Army aeroplane in pre-war days. "He was very anxious," he said, "that an International league might be started whereby there would always be a great majority of aeroplanes of different nations which could always be called upon to coerce those who did not respond to the rules of what I might call the 'game' of air-fighting; he visualised the bombing of open towns." Had that been done, the world would probably not have found itself in the terrible plight in which it was to-day.

Councillor J. Ure Primrose replied to the toast of the Association. Major R. C. Macpherson replied to the toast of The Imperial Forces, proposed by Mr. Thomas Hunter, M.P. for Perth. He recounted some interesting experiences with early machines.

Another Trans-Canada Stage

THE extension of the Trans-Canada Air Lines' service from Montreal to Moncton, N.B., is due for September 1, according to an announcement made by the Minister of Transport at Ottawa. The facilities for this extension are now practically complete. At the same time Mr. Howe said that a direct service would very shortly be started between Toronto, Ottawa and Montreal, as well as others between Toronto and Buffalo and Toronto and Detroit, to connect with the U.S.

Since operations were started on April 1, the passenger expectations on the night run, in both easterly and westerly directions along the trunk route have been exceeded, and very shortly an additional daytime service may be opened. As explained elsewhere, five more Lockheed Fourteens have been ordered for delivery next month by the company. Incidentally, the domestic air mail service should, according to calculations, begin to pay for itself when it carries 2,380lb. of mail daily.

Subsidiary Absorption?

THE other week—actually in the issue of June 15—in commenting on the British Overseas Airways Corporation Bill, we rather jumped to conclusions in suggesting that such subsidiary companies as Wilson Airways and Rhodesian and Nyasaland Airways would shortly be absorbed by the parent company.

Actually, there has been, from time to time, a possibility that such absorption might take place, but we learn that, after due consideration, Imperial Airways feel that such services are primarily the concern of the local public and that, consequently, a local organisation best serves those interests. In fact, Imperial Airways do not wish to take over feeder line concerns, which must obviously have their own special needs and requirements. In a general way it is probably better always that trunk services should be looked after by a large national concern, branch lines being dealt with locally.

COMMERCIAL CROSSING

Pan-American Airways Start Their Regular Atlantic Service

WHEN we went to press last week the Boeing 314, *Yankee Clipper*, was still at Shediac, New Brunswick, because of very bad weather reports from Botwood. This machine was making the first mail flight by the North Atlantic route and was carrying twenty-one special observers, a crew of twelve, and 1,734 lb. of mail. The composition of the passenger list was briefly explained last week, and the machine was in command of Capt. Harold E. Gray. The machine left Shediac at 5.55 p.m. on June 27, reaching Botwood at 10.18 p.m. and leaving there again at 1.26 a.m. The 1,900-mile crossing from Botwood to Foynes was covered in 13 hr. 41 min. and the *Yankee Clipper* was put down off Foynes at 3.7 p.m. on June 28, leaving for Southampton again at 6.12 p.m.

At Hythe the passengers were welcomed in the evening by Sir Francis Shelmerdine, the D.G.C.A., by Mr. W. Craven-Ellis, M.P. for Southampton, Alderman Sir Sydney Kimber, on behalf of the Southampton Harbour Board, and the Mayor of Southampton Sir Francis remarked on the occasion that he hoped that our own transatlantic service would be started in August.

When the *Yankee Clipper* reached Foynes on Wednesday of last week, the passengers and crew were received by Mr. de Valera and his Minister for Posts and Telegraphs, Mr. Oscar Traynor, with officials of the various State Departments. At this point fourteen bags of mail were taken ashore.

The probability of the British service starting next month was also announced by Sir Kingsley Wood at a welcoming luncheon in London. He said that the service would be started with the modified "C"-class boats, but that next year we should have comparable equipment with that used by Pan-American Airways, when the new "G"-class boats would be in service.

Meanwhile the third Boeing 314, *Dixie Clipper*, had taken off at Port Washington on Wednesday to make the first regular flight over the southern route. The machine was carrying twenty-two paying passengers, including one who reserved his seat as long ago as 1931. Another of the passengers was the first to go across the North Atlantic in the *Graf Zeppelin* and has also flown on the P.A.A. Pacific service. Among the other passengers was Mrs. Juan T. Trippe, the wife of the P.A.A. President, as well as four directors of the concern. Evidently the company has every faith both in the machine, the equipment and the crew. *Dixie Clipper* reached Lisbon after a stop at the Azores at 8.5 p.m. on June 29, and was commanded by Capt. R. O. D. Sullivan, one of the pioneers of the Pacific service. The machine arrived at Marseilles at 2.40 p.m. on June 30 and left again last Sunday morning on the return flight, carrying one or two of the passengers, including Mr. J. T. Trippe, who had come over the previous week in the *Yankee Clipper*.

This machine, in its turn, had left Southampton on June 30, carrying 820 lb. of mail and fifteen of the seventeen passengers originally brought over. New York was reached on July 2.

The New Boats in Service

THREE of the new strengthened "C" class boats were due to go into service this week on the England-India route. These three, *Clyde*, *Awarua*, and *Australia*, will take the place of the landplanes which have been operating supplementary services between Alexandria and Karachi, the crews of these machines to return to Croydon for training on the A.W. Ensign fleet.

Actually, of course, this is not the service for which these machines are eventually destined. The *Clyde* will be put on the New York-Bermuda service, and the other two, with *Aotearoa*, should be flying this autumn on the Tasman Sea service. By that time the Ensigns should be ready to take over the supplementary service between London and Calcutta.

"Guba" Goes On

AFTER the special Consolidated boat's arrival at Mombasa on June 21, following its survey flight across the Indian Ocean, no further information came through until last Saturday, when it was learned that *Guba* had arrived at St. Thomas, in the Virgin Islands, West Indies, at 10.30 a.m. on June 30.

In the interim it had been imagined that the boat was still based on the East Coast of Africa preparatory to the planned trip across the Continent, and, later, across the south Atlantic. The boat made a non-stop flight from Dakar, Senegal, and covered the 3,200 miles in about 19 hours. It was due to leave again for New York on Sunday.

I.C.A.N.'s Twenty-seventh

EARLY this month, between June 6 and 12, the International Commission for Air Navigation held their twenty-seventh session in Copenhagen Of the thirty-two member States, twenty-seven were actually represented—Britain by Lt.-Col. Sir Francis Shelmerdine and, as experts, Messrs. W. W. Burkett, R. L. Megarry, and Major R. L. Nunn. The president was the Danish Director of Civil Aviation, Mr. M. K. Gregersen.

The questions dealt with during the session were mainly of a routine nature, including alterations to standard international maps, the decision to put the new meteorological codes into force, the introduction of regulations concerning the international employment of certain technical symbols and terms used both in aerodynamics and navigation, and the institution of new regulations governing aircraft movements in conditions of bad visibility.

The I.C.A.N. also dealt with the revision of international radio regulations which had been adopted by the conference at Cairo. The new instructions will come into force on September 1, 1939, but will be revised later. New rules were adopted in the matter of airworthiness certificates, including those pertaining to the strength of landplane undercarriages, particularly in the case of long-distance machines, stability and control efficiency, and take-off requirements.

In addition the Commission made an important revision of the regulations concerning engine construction, these to come into force after January 1, 1940. Finally, it was recommended that the contracting States should make it a rule that commercial machines flying at an altitude greater than 3,500 metres (11,500ft.) must be equipped with oxygen apparatus for use by the passengers.

Western Airways in Manchester

UNTIL the second Percival Q6 is delivered, Western Airways have been operating their Weston-Bristol-Manchester service, which started on June 17, with a Q.6 and-two De Havilland Rapides. The company is now in its offices at Ringway, where Mr. E. O. Round is their traffic manager; he was previously with Jersey Airways.

New Services in Africa

JUST at the moment large-scale extensions of the air services in South and Central Africa are being discussed by the various Governments and other representatives. For instance, next January it is probable that a new overland Imperial Airways' service will be started between Kisumu, Salisbury and Durban.

Two other new services, to be operated respectively by South African Airways and Rhodesian and Nyasaland Airways, are under consideration. These will link Johannesburg with Ndola by slightly different routes, South African Airways' service running via Bulawayo and Livingstone, and R.A.N.A.'s between Bulawayo and Salisbury.

Stratospheric North Atlantic Tests

AIR FRANCE-TRANSATLANTIQUE are going ahead with preparations for the interesting series of high-altitude test flights across the North Atlantic, which are to be undertaken this summer under the command of Paul Codos. The four 4-engined Farman landplanes which make up this specialised fleet are the *Laurent Guerrero* in which Codos flew from Paris to Santiago, Chile, 9,360 miles, in 58½ hours in November, 1937; the *Flammarion*; *Jules-Verne*; and *Le Verrier*. The first-named machine, now having the finishing touches put to the oxygen equipment which will be used in the hermetically sealed pressure cabin, had a two-hour cruise at over 24,000 feet last week, piloted by Coupet and having on board Air Ministry technical experts attached to the high-altitude flying section.

THE ROYAL AERO CLUB

News and Official Notices for the Week Ended July 1

Synchronised Certificates

TIME lag in Civil Air Guard training caused by the interval which elapses between the granting of the Royal Aero Club Aviator's Certificate and the issue of the Air Ministry "A" Licence has been eliminated as the result of a new system of synchronisation.

In future, both documents will bear the same date, and on receipt of the Aviator's Certificate the C.A.G. member will be entitled to go ahead with his training pending the receipt of the Air Ministry Licence.

The practice of the Royal Aero Club has been to pass applications to the Air Ministry on the date of their receipt and the Aviator's Certificate is issued about four days afterwards. The receipt of this Certificate will now be an acknowledgement that the application for the "A" Licence is in order and has been forwarded to the Air Ministry.

All clubs undertaking Civil Air Guard training have been notified of this change.

R.Ae.C. Vice-Chairman

MR. FREDERICK HANDLEY PAGE, founder and managing director of the aircraft construction company which bears his name, has accepted re-election as Vice-Chairman of the Royal Aero Club for the present year. Mr. Handley Page recently celebrated the thirtieth anniversary of the incorporation of his company, and he is one of the best known aircraft constructors in the world.

F.A.I. Conference

A FINAL decision has been taken as to the place for the 39th Annual Conference of the Fédération Aéronautique Internationale. It will start at Geneva from September 18 to 20 and will continue in Zurich from 21 to 23. The names of the delegates from the Royal Aero Club will be notified later.

A message of condolence was sent to the Fédération Aéronautique Internationale by the Royal Aero Club on the death of M. Louis Hischauer, who had been Chairman of the International Aeronautical Sporting Commission of the F.A.I. since 1926. The funeral service was held on June 13, at Vence in the Alpes Maritimes, where M. Hischauer has been living for some months. He was buried in Montparnasse cemetery in Paris.

Air Defence Cadets

CAPTAIN BALFOUR, Under-Secretary of State for Air, has been taking a great interest in the training of Air Defence Cadets at gliding camps. He recently visited the camp at Caxton Gibbett, run by the Cambridge University Gliding Club, and subsequently expressed himself as being very pleased with the arrangements there.

On the Air Routes:

BELGIUM: Brussels Aerodrome.—An air meeting will be held at this aerodrome on July 9, from 1500 to 1800 hours. With the exception of regular air services, aircraft not taking part in the meeting may not utilise or fly above the aerodrome that day from 1200 hours to 2400 hours. From July 8 barriers may be installed along the west side of the aerodrome from south to north.

FRANCE: Danger Area.—Firing practice seawards will be carried out at *Fort Carré Range* (approximately 7 miles S.S.W. of *Nice Aerodrome*) throughout July, 1939, at the following times:—By day: 0700 hours to 1800 hours. By night: 1900 hours to 2300 hours.

A red flag will be displayed at *Fort Carré, Antibes*, during practice. Pilots are warned to exercise caution.

Aviators' Certificates

No.	Name	Club or School	Date
18,703	Hugh Stratford O'Conor	Worcestershire F.C.	13.6.39
18,704	George Patrick Bache	Worcestershire F.C.	11.6.39
18,705	Charles John Alpe	Norfolk and Norwich Ae.C.	14.6.39
18,706	Owen Sydney Rogers Collett	Norfolk and Norwich Ae.C.	14.6.39
18,707	Walter Petch	Doncaster Aero Club	11.6.39
18,708	William Florence Macgregor	Doncaster Aero Club	11.6.39
18,709	Kelvin Cartlidge	Doncaster Aero Club	11.6.39
18,710	Edward Bromley-Davenport	Lancashire Aero Club	9.6.39
18,711	Frances Giklas Sully	Midland Bank Flying Club	13.6.39
18,712	Arthur Leodard Harrison	Hull Aero Club	5.6.39
18,713	Cyril Clark	Hampshire Aeroplane C.	9.6.39
18,714	Henry Castleman O'Hara Moore	Hampshire Aeroplane C.	9.6.39
18,715	John Joseph Wyllie Lawton	Portsmouth Aero Club	9.6.39
18,716	Charlotte Helen Bonham Carter (Lady).	Airwork Flying Club	12.6.39
18,717	Bezley Richard Geary	Norfolk and Norwich Ae.C.	10.6.39
18,718	Robert Powis	York and Leeming F.C.	9.6.39
18,719	John Stewart Pott	Doncaster Aero Club	11.6.39
18,720	Stanley Robert Gibbons	Lincolnshire Aero Club	14.6.39
18,721	Hubert Alan King	Wiltshire Flying Club	11.6.39
18,722	Vivien Frances Jeffery	Wiltshire Flying Club	10.6.39
18,723	Edward Norman Hobbs	Plymouth and District Aero Club.	14.6.39
18,724	John Robertson	Strathtay Aero Club	13.6.39
18,725	Gerald Eric Main	London Aeroplane Club	13.6.39
18,726	Harry Peters	London Aeroplane Club	15.6.39
18,727	Charles Ernest Band	Witney and Oxford Ae. C.	10.6.39
18,728	Gareth Leofric Nowell	No. 9 E. and R.F.T.S., Ansty.	15.6.39
18,729	George Gunn	Edinburgh Flying Club	5.6.39
18,730	Edward Mason Collard	Bournemouth Flying Club	10.6.39
18,731	Norman James Newton	Bournemouth Flying Club	8.6.39
18,732	Reginald John Nelson Norris	Bournemouth Flying Club	12.6.39
18,733	Cyril James Day	Bournemouth Flying Club	12.6.39
18,734	George Alfred Barker	Newcastle-on-Tyne Ae. C.	7.6.39
18,735	Harry Reed Stothard	Newcastle-on-Tyne Ae. C.	3.6.39
18,736	Ernest Reginald Newham	Tollerton Aero Club	9.6.39
18,737	Joan Irwin Broadsmith	Isle of Wight Flying Club	7.6.39
18,738	Archibald Alexander Walker	Midland Bank Flying Club	15.6.39
18,739	George Clapperton	Liverpool and District Aero Club.	6.6.39
18,740	Alexander Helme	Liverpool and District Aero Club.	2.6.39
18,741	June Suzanne English	Norfolk and Norwich Ae.C.	15.6.39
18,742	George Edward Laws	London Transport F.C.	14.6.39
18,743	Hamish Muir Turner Tod	Scottish Flying Club	7.6.39
18,744	Harold John Reynolds	Scottish Flying Club	11.6.39
18,745	Eric William Bignell	Northants Aero Club	11.6.39
18,746	Christabel Ivy Davey	Airwork Flying Club	16.6.39
18,747	Frederick Kenneth Earl	Reading Aero Club	11.6.39
18,748	David George Grimmett	Reading Aero Club	11.6.39
18,749	Edward Henry Blinkhorn	London Aeroplane Club	15.6.39
18,750	Hubert John Howard	London Aeroplane Club	16.6.39
18,751	John Henry Ford Ford	London Aeroplane Club	15.6.39
18,752	Alfred Ernest Wickens	Malling Aero Club	19.6.39
18,753	Daisy Elinor James	Malling Aero Club	19.6.39
18,754	Robert Joseph Drummond	Cardiff Aeroplane Club	19.6.39
18,755	Leslie Smith	Cardiff Aeroplane Club	19.6.39
18,756	John Charles Shute	Cardiff Aeroplane Club	19.6.39
18,757	Watkin Morgan	Cardiff Aeroplane Club	19.6.39
18,758	Arthur William Wood	Yorkshire Aeroplane Club	19.6.39
18,759	Claude Harry Fanner	Isle of Wight Flying Club	19.6.39
18,760	George Wilson	Worcestershire F.C.	19.6.39
18,761	Thomas Gordon Juckes	Worcestershire F.C.	19.6.39
18,762	Leslie Charles Oliver	York and Leeming F.C.	19.6.39
18,763	Alfred Leonard Hill	York and Leeming F.C.	19.6.39
18,764	Allan John Hancock	North of Ireland Aero C.	19.6.39
18,765	John Anthony Donnelly	North of Ireland Aero C.	19.6.39
18,766	John Aynsley Simpson	Southend Flying Club	19.6.39
18,767	Dennis Percy Lead	Kent Flying Club	19.6.39
18,768	Paul Edward Russell Blake	Brooklands Flying Club	19.6.39
18,769	Peter Favell Scott	Portsmouth Aero Club	19.6.39
18,770	George Eltham Sharvell	London Air Park F.C.	19.6.39
18,771	Frank Cole	London Air Park F.C.	19.6.39
18,772	George Hallam-Clarke	Surrey Flying Services	19.6.39
18,773	Lawrence Noble Wilson	London Air Park F.C.	20.6.39
18,774	Jack Brigham	London Air Park F.C.	20.6.39
18,775	Hugh Sainsbury Cuthbertson	London Air Park F.C.	20.6.39
18,776	Gerland Valentine Isaacs	Airwork Flying Club	20.6.39
18,777	Richard George Keddie	Southend Flying Club	20.6.39
18,778	John James Roman	Romford Flying Club	20.6.39
18,779	Bernard Cecil Wood	West Suffolk Aero Club	20.6.39
18,780	Sydney Gordon Burden	Redhill Flying Club	20.6.39
18,781	Hugh Hughes Green	Doncaster Aero Club	20.6.39
18,782	Norman Braithwaite	Doncaster Aero Club	20.6.39
18,783	Kenneth Spring	County Flying Club	20.6.39
18,784	Dennis Thomas Merry	County Flying Club	20.6.39
18,785	Douglas Alonzo Twyman	De Havilland School of Flying.	20.6.39
18,786	Robert Charles Reynolds	Brooklands Flying Club	21.6.39
18,787	Arthur Eric Harding	Portsmouth Aero Club	21.6.39
18,788	Archibald Joseph Macdona'd	London Air Park F.C.	21.6.39
18,789	Kenneth Hew Smith	Redhill Flying Club	21.6.39
18,790	Kenneth Sidney Wombwell	Bedford Aero Club	21.6.39
18,791	Douglas Lawley Stevens Wood	Midland Aero Club	21.6.39
18,792	Elizabeth Rosemary Dyson	Herts and Essex Ae. C.	21.6.39
18,793	Richard John Carter	Southend Flying Club	21.6.39
18,794	Stanley Searles	Southend Flying Club	21.6.39
18,795	Francis Geoffrey Evans	Horton Kirby Flying Club	21.6.39
18,796	John Grover Halford Mills	Horton Kirby Flying Club	21.6.39
18,797	Harold Edward Meason	Horton Kirby Flying Club	21.6.39
18,798	David Edward Castle	Witney and Oxford Ae. C.	21.6.39
18,799	Cecil Hubert Colmer	Cinque Ports Flying Club	21.6.39
18,800	Charles Joseph Bourner	Cinque Ports Flying Club	21.6.39
18,801	Richard George Hobbins Parnell	Portsmouth Aero Club	21.6.39
18,802	Kathleen Ruth Breakell	Exeter Aero Club	22.6.39
18,803	Frederick Hugh Warburton	Exeter Aero Club	22.6.39
18,804	William Arthur Cowdry	Exeter Aero Club	22.6.39
18,805	Hester Mary Lake Wilmott	Exeter Aero Club	22.6.39
18,806	Gerald Russell Cooper	Wiltshire Flying Club	22.6.39
18,807	John Eric Darby	Isle of Wight Flying Club	22.6.39
18,808	James William Morrow	Romford Flying Club	22.6.39
18,809	Ralph Worton Harris	Leamington, Warwick and Dist. Aero Club.	22.6.39
18,810	Frederick Gordon Howe	Romford Flying Club	22.6.39

BRITAIN in BRUSSELS

Some Details of the Aero Exhibition : British Exhibits to Occupy Over One-third of Total Space

EIGHT nations will be represented by 150-odd exhibitors at the Brussels Aero Show, which opens next Saturday at the Grand Palais du Centenaire, Brussels.

From the preliminary lists it is somewhat difficult to assess the comparative importance of each country's contribution, since in a number of instances a collective exhibit is obviously being staged. Thus, in the case of the German display, some thirty-three firms appear in the list; at the last Brussels Show, two years ago, there was a similar total for Germany, yet the whole of the firms were consolidated on one comparatively small stand displaying only two or three actual aeroplanes and the majority of German companies were represented only by models and photographs. This year, actually, the German exhibit will be in an annexe, so it may be on a larger scale.

There is no doubt about the impressiveness of the British section, correlated by the S.B.A.C. Twenty-four firms have taken space which, it is said, will occupy more than one-third of the total floor area available. Including a contribution by the Air Ministry, Great Britain will be represented by ten aircraft, eleven engines, and numerous accessories. Details appear on this page.

The Air Ministry exhibit will consist of a Vickers Wellington—which should be easily the largest aeroplane in the show—a Hawker Hurricane (twenty of which have been acquired by the Belgian Air Force) and a Supermarine Spitfire. The last-named is particularly interesting, for it will be a special speed version of the standard 367 m.p.h. Spitfire and will have a four-bladed airscrew. Sqn. Ldr. D. F. Atcherley will be in charge of the exhibits.

In addition to the British exhibits detailed in the following paragraphs, Continental companies associated with British concerns will have a number of notable exhibits—e.g., Avions Fairey will show a Tipsy monoplane and, possibly, a P.4 bomber-fighter as supplied to the Danish Navy, while such well-known names as Hobson, Zenith and Timken will also be found in this connection.

The opening of the show will be marked by the holding, on Sunday, of a military flying display at Evère aerodrome; judging by advance details, this display, which also celebrates the 25th anniversary of the formation of the Belgian Air Force, should be one of the most remarkable of its kind ever held. A squadron of R.A.F. Wellingtons is to give an exhibition of formation flying, and Germany is to contribute squadron aerobatics by nine Bücker Jungmeisters. Gen. Milch, German Under-Secretary for Air, will attend at the invitation of the Belgian Government.

The British Exhibits

ACCLES AND POLLOCK, LTD.—This firm will show steel, steel alloys and stainless-steel tube to B.E.S.A. specification, including manipulated and machined tubes, with honed and ground finishes. There will also be cold-rolled sections in duralumin, other light alloys, and high-tensile steel, together with examples of welded and assembled tubular components.

AIRSPEED (1934), LTD.—Here Continental visitors will have an opportunity of inspecting a twin-engine training type widely used in the Royal Air Force, for an Oxford will be on exhibition. As is well known, this is a wooden aircraft powered with two Armstrong Siddeley Cheetah X engines, and capable of a top speed of 197 m.p.h.

ALVIS, LTD., will be showing two air-cooled radials. Presented as a complete installation, with all equipment forward of the fireproof bulkhead incorporated, one will be the nine-cylinder, single-row, medium-supercharged Leonides, rated at 415/435 h.p. at 3,000 r.p.m. and 8,250ft. Its take-off rating is 430/450 h.p. The overall diameter is only 41¼in. The other engine will be the 14-cylinder, two-row, medium-supercharged Pelides engine, which is rated at 1,025/1,065 h.p. at 2,150 r.p.m. and 5,000ft. The take-off power is 1,060 h.p. The overall diameter is 52in. and the dry weight 1,475 lb.

AUTOMOTIVE PRODUCTS CO., LTD.—The main exhibit will be a demonstration unit of a complete Lockheed undercarriage, with the hydraulic system also operating flaps, bomb doors and hoists. The undercarriage system includes the operation of fairing doors equipped with an interlocking system by which the fairings do not begin to close until the undercarriage is completely retracted. In addition, there will be various examples of other Lockheed aircraft equipment in both sectioned and complete form, including wing-bolt mechanisms.

Demonstration

AVERY EQUIPMENT, LTD.—Occupying the same stand as that of the company with which they are associated—Automotive Products Co., Ltd.—this firm will show a replica of the testing equipment used for ascertaining the performance of aircraft landing wheels under service conditions. The test wheel is attached to a loading arm which can reproduce the effect of a heavily "dropped" landing. The wheel falls on two rollers rotated by an electric motor and operating a dynamometer to check brake performance. Various examples of complete and sectioned Avery undercarriage and tail wheels will also be shown, together with the latest Avery self-sealing couplings.

BLACKBURN AIRCRAFT, LTD. (Cirrus Engine Division).—Here will be seen the Cirrus Minor and Major engines in their latest form. In both these four-cylinder-in-line units, simplicity and reliability have been the chief aim. The Minor has a normal output of 82 b.h.p. at 2,300 r.p.m. and a maximum of 90 b.h.p. at 2,600 r.p.m. The Major offers a normal output of 138 b.h.p. (2,200 r.p.m.) and a maximum of 150 b.h.p. (2,450 r.p.m.). Both these engines are in use in light training and other aircraft in many parts of the world.

BRISTOL AEROPLANE CO., LTD.—Scale models will represent Bristol aircraft, but actual engines will be exhibited. The items are as follows: (1) A scale model of the Beaufort high-speed, general-purpose, reconnaissance torpedo bomber (two Taurus sleeve-valve engines of over 1,000 h.p. each); (2) a scale model of the Blenheim (two Mercury XV), which is the fastest medium bomber in service anywhere in the world; it has a top speed of 295 m.p.h. and a range of 1,900 miles; (3) a scale model of the Bombay bomber-transport (two Bristol Pegasus') which accommodate 24 fully armed troops; (4) a Bristol Taurus engine.—A double-row, 14-cylinder, sleeve-valve engine of 25.4 litres capacity, developing 1,010 b.h.p for take-off and 1,065 b.h.p. at 5,000ft.; it measures only 46½in. in diameter; (5) a Bristol Pegasus XVIII engine.—Nine-cylinder poppet-valve radial, with two-speed supercharger, developing 965 b.h.p. for take-off, 1,000 b.h.p. at 3,000ft., and 885 b.h.p. at 15,500ft.

CELLON, LTD.—Here will be found a range of panels showing finishes obtained with the well-known *Cellon* doping schemes for both Service and civil aircraft. The Service finishes include a range of various camouflage schemes adaptable for any country. In addition, there will be a full range of panels showing finishes obtainable with "*Cerric*" cellulose and "*Cerrux*" synthetic materials, special chromated primers for light alloys, etc. An exhibit of particular interest will demonstrate protection and obliteration of riveting and overlapping joints, etc., by means of the *Cellon* strip sealing process.

DE HAVILLAND AIRCRAFT CO., LTD.—An up-to-the-minute exhibit that should arouse a good deal of interest is the D.H. Moth Minor, which is being shown in open cockpit form. This little machine, which was fully described in *Flight* last week, cruises at 100 to 105 m.p.h., carrying two people, 129 lb. of luggage and fuel for 300 miles. The newest engine in the Gipsy range will also be exhibited—the 90 h.p. Minor, which will be seen installed in the Moth Minor. Also on view will be the 525 h.p. geared and supercharged Gipsy Twelve and the well-established Gipsy Major and Gipsy Six. Lastly, a cut-away working model of a D.H. constant-speed airscrew and governor mechanism will be shown, and there will be a hydromatic quick-feathering three-bladed airscrew.

DUNLOP RUBBER CO., LTD.—Here will be found an outsize aircraft wheel and tyre—a 26.00 by 26—capable of carrying a maximum load of 27,500 lb. The exhibit will also show other sizes of Dunlop aircraft wheels and tyres, including a tail wheel and the Ecta electrical earthing tyre; Dunlop brake and gun gear equipment; samples of "Duprene" heat- and oil-resisting artificial rubber; and various shock-absorber parts and other details.

Hot and Cold

GALLAY, LTD., will show their well-known system of non-corrosive radiator construction with cupro-nickel elements, an example exhibit being the radiator produced in large numbers for the Fairey Battle. An oil cooler built on the new Gallay aerodynamic principle is interesting, low drag and small frontal area making a special appeal to aircraft designers. Cabin-heating equipment will be represented by examples of various types of boilers and heaters, together with the complete installation as fitted to the Harrow, Hampden, Wellington, etc. Protected fuel tanks made by Gallay will be represented by an Airspeed "Oxford" tank with crash- and bullet-proof covering. A combined oil tank and cooler, as made for the Airspeed Oxford, will be shown.

GENERAL AIRCRAFT, LTD.—The first production Cygnet, powered with a Cirrus Major engine, is certain to attract a great deal of attention, not only on account of its all-metal construction, but also for its tricycle undercarriage, now well beyond the experimental stage. It carries two people side by side, cruises at 118 m.p.h. on 70 per cent. power and has a range of 550 miles. It has a landing range of between 60 and 85 m.p.h. and it remains under full control down to 46 m.p.h.

HAWKER SIDDELEY AIRCRAFT CO., LTD.—Here will be found an exhibit which is sure to provide a great attraction, not only on account of its technical interest, but, by reason of the fact that the fame of the Hurricane is well known on the Continent. A Hurricane fuselage and centre section will be shown in skeleton, and there will also be a skeleton wing. The engine side of the company's business will be represented by an Armstrong Siddeley Cheetah XI engine (which now develops no less than 460 h.p.) and the Tiger two-speed supercharger.

(*Concluded on p.* 20.)

The INDUSTRY

Attractive factory designs with an eye to the manufacturer's requirements are only a part of the service offered by Commercial Structures, Ltd.

For Remote Control

FEW realise how extraordinary has been the progress of the makers of Teleflex controls in the past two and a half years. At first, this type of control was regarded as something novel, but to-day it has become a necessity with a wide number of applications in aircraft. On large machines several hundred feet of Teleflex cable are often used for operating elevator and rudder servos and their indicators, radiator shutters, landing lights, fuel cocks, engine controls and constant-speed airscrew controls. In fact, so great has been the demand that M.R.C., Ltd., have been compelled to extend their works at Chadwell Heath, Essex, no fewer than three times within the last year.

Basically, the Teleflex control is designed to transmit push-and-pull loads by means of a flexible cable. This cable operates in either a rigid light alloy conduit or a flexible casing. Actually, the flexible cable has four separate components. As shown in the drawing, there is the inner tension cable (B), composed of a number of high-tensile steel strands with a strength of between 110 and 120 tons/sq.in. Round this cable is a compression wire (C), which is wound in the opposite direction from the lay of the inner cable. Finally a large-diameter wire (E), interspaced by three wires of smaller diameter (D), is wound in the opposite direction to that of the previous layer.

The large or helix wire is wound to limits of plus or minus 0.0005in. for both pitch and outside diameter. This wire engages in the manner of a flexible rack with toothed wheels of a suitable pitch for transmitting movement by either a rotary or push-pull action. In the case of the latter it is not always essential to use a wheel drive; instead, sliding or swivel ends can be employed.

In the case of throttle controls, etc., where a wheel drive is employed, a special machined Bakelite laminated casing is used. The cable meshes with the teeth of the wheel, and its end is bent over and "tucked" into a slot cut into the wheel. The cable, incidentally, can be cut at any point without fear of it unravelling.

Originally the Teleflex control was designed to operate with conduit tubes drawn from dural T.4, but since then M.R.C., Ltd., have developed a special flexible cable for which it is claimed that backlash is eliminated. This cable is manufactured under the trade name of Teleflex-Uni.

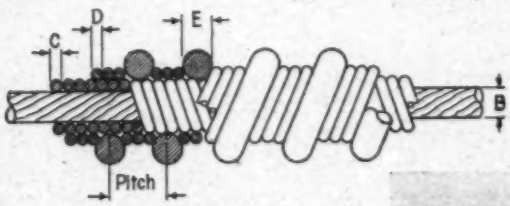
The Company has designed a special but simple former for bending the conduit tubes wherever this should be necessary.

The applications of Teleflex controls are almost legion in number, yet most of them are described with drawings and full detailed specifications in a sixty-page booklet which is obtainable from M.R.C., Ltd.

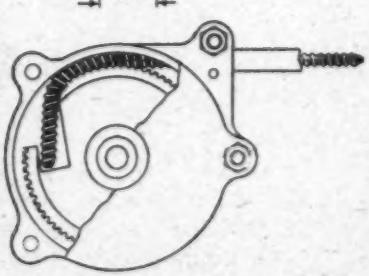
Factory, Sir?

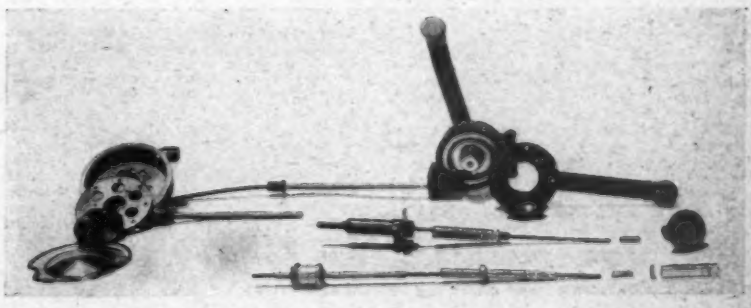
THERE must at the present moment be many manufacturers faced with the question of expansion, and wondering whether to extend present works or build on a new site. Both cases involve problems with which the average manufacturer is unfamiliar. The new site might result in increased transport costs; alternatively, the necessary skilled labour might be scarce. These are merely two points which seem reasonably obvious and yet are surprisingly often overlooked.

With the object of assisting the manufacturer in regard to such decisions, Commercial Structures, Ltd., of Staffa Road, Leyton, London, E.10, have devised a plan of service which must be unique in this country. The service embraces all problems connected with site selection, design and factory construction. It also combines and co-ordinates the activities of all those specialists whose services are usually employed separately, such as surveyors, engineers, architects and builders. In the case of Commercial Structures, Ltd., all these specialists work together under one roof. The building section alone is able to undertake the whole of the building contract, including steelwork, reinforced concrete, heating and



Some idea of the construction of the Teleflex cable can be gained from the sketch shown on the left; an explanation appears on this page. The other drawing illustrates the manner in which the cable is secured to the toothed wheel of the control, while in the photograph below various examples of Teleflex controls are shown.





ventilation installations, electrical and power installations, joinery and plumbing, etc., without having to depend on sub-contractors. Obviously, this alone means a big saving in time and money.

The C.S. service is able to provide a scientific analysis of site, labour, transport, and market proximity requirements. The Company's engineers, working in co-operation with the manufacturer, can advise on plant layout and use it as the basis for their design. All details connected with the passing of plans by local authorities are looked after. Finally, the Company is in a position to provide finance terms and facilities for the purchase or rental of building land.

All this is a flexible service, in that any sections may be used separately.

Factories built by Commercial Structures, Ltd., are in the main of the ground floor, daylight type, the construction of which has been partially standardised, with the consequent reduction of building costs and time taken in erection. Incidentally, the Company is able to complete, in certain circumstances, comparatively large factories within a period of eight weeks from the word "Go." It is, of course, able to build with equal facility multi-storey structures wherever site costs demand it.

All C.S.-planned factories—there are already some 250 in existence—are built for sale or rent. For the manufacturer who requires new premises in a hurry, the Company possesses a number of factories constructed to a standard design that are always held available. These buildings are planned so that they can be readily adapted to suit the individual requirements.

Moulded Synthetic Tapers

THE moulding of laminated plastic materials on a sound production basis has proved a stumbling block to many manufacturers, but the production of rolled and moulded *taper* tubes in this same material presents an even more complex problem.

For some time now Ellison Insulations, Ltd., of Perry Barr, Birmingham, 20, the manufacturers of Tufnol, have been carrying out research in this connection, with the result that the Company is in production with several hundreds of aircraft aerial masts, streamlined, and with a pronounced overall taper. The material of which these masts are made is, of course, Tufnol. They are 49in. long with section dimensions at the base of 6in. by 2in. The mast tapers down to 4½in. by 1½in.

The fact that Ellison Insulations, Ltd., have been able to produce on a commercial basis tapered tubes in Tufnol of the type described indicates that the Company should not be long in developing larger components in the same material.

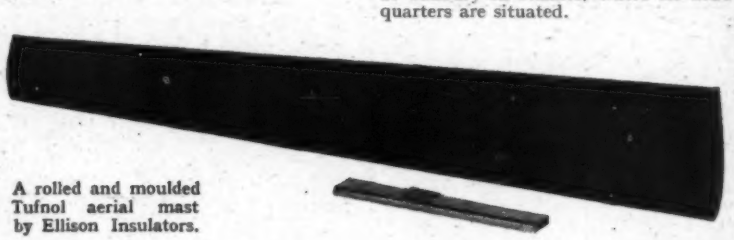
A Habershon Appointment

LAST week it was announced by J. J. Habershon and Sons, Ltd., the well-known Rotherham strip and sheet steel manufacturers, that Mr. J. H. Whitham had been appointed to the position of technical director to the company—a post which was rendered vacant by the recent death of Mr. Horace Brearley.

Mr. Whitham has had long experience in the production and manipulation of high-grade and special alloy steels with J. J. Saville and Co., Ltd., of Sheffield. For some years Mr. Whitham and Mr. Brearley had worked in close co-operation in connection with the production of aircraft strip and sheet steel, for Saville and Co. have over a long period been the main suppliers of alloy steels to Habershon and Sons.

* * *

Mr. M. A. Jane, A.M.I.Mech.E., has been appointed to take charge of the British Thermostat Company's new Birmingham office at Essex House, 27, Temple St., Birmingham, 2. Mr. Jane was for many years with the company at Sunbury-on-Thames, where its headquarters are situated.



A rolled and moulded Tufnol aerial mast by Ellison Insulators.

BRITAIN IN BRUSSELS

(*Concluded from page 18.*)

HIGH DUTY ALLOYS, LTD.—This exhibit, provided by High Duty Alloys, Ltd., and its associated company, Magnesium Castings and Products, Ltd., will be composed of examples of the "Hiduminium" high-tensile alloys in cast and wrought forms. Crankcase, cylinder block and head castings will show the intricate shapes and thin sections which can be obtained with adequate strength. Large stampings, from which cylinder head and barrels, crankcases, etc., are machined, are typical examples of components having extremely high strength/weight ratio. Other items will include undercarriage fork stampings, airscrew blade stampings, a magnesium airscrew blade pressing, a number of "Magnuminium" sand and die castings, and examples of research work from the company's laboratories.

JABLO (HOLDINGS), LTD.—The specialised airscrew and wood reinforcement technique evolved by this company will be illustrated by a number of exhibits, including a finished v.p. blade, a blade showing various stages of covering, a section of v.p. blade shaped "in the white," a complete reinforced board, a board with loose laminations to show Tego-film glue, and samples of reinforced wood.

D. NAPIER AND SON, LTD.—Unique among the power plants on exhibition will be the 24-cylinder H-shaped Napier Dagger VIII, which is an air-cooled unit with a total cylinder capacity of 16.8 litres. It is notable in that it gives 175 h.p. per square foot of frontal area, the maximum power being 1,000 h.p. at 8,750ft. The dry weight is 1,390 lb.

PHILLIPS AND POWIS AIRCRAFT, LTD.—A standard Miles Magister will be exhibited, while another machine of this type is to be demonstrated at the military flying display. As is well known, this is a two-seater wooden construction trainer, with 130 h.p. Gipsy Major engine. It has a top speed of 145 m.p.h. and is widely used in the Royal Air Force and Reserve schools for training in general and blind flying.

REID AND SIGRIST, LTD.—Both the new aircraft which this firm has produced and the instruments on which it has built up its reputation will be featured at Brussels. The aircraft is the twin-engined trainer, a three-seater mid-wing type of wooden construction and powered with two Gipsy Six Series II engines. The cruising speed is in the neighbourhood of 190 m.p.h. at 6,000ft. The R. and S. instruments shown will consist of the artificial horizon, bubble-type turn indicator, fore-and-aft level, Gyorizon, mirror pitch indicator, sensitivity controls, turn indicator (R.A.F. type), and venturi.

ROLLS-ROYCE, LTD.—The products of this firm will need no introduction to Continental visitors at Brussels. Two Merlin types—the III and the X—will form the exhibit. The Merlin III is a fully supercharged unit giving a maximum output of 1,030 h.p. at 16,250ft., while the Merlin X has a two-speed blower and in high gear gives 1,010 h.p. at 17,750ft. Operating in low gear, it delivers 1,130 h.p. at 5,250ft. All figures are for operation on 87-octane fuel.

ROTAX, LTD.—The complete range of Rotax-Eclipse aero engine starters will be on view, including a number of fully sectioned models. Among the other Rotax items will be the latest fourteen- and nine-cylinder magnetos. A range of flap and undercarriage motors, limit and solenoid switches will be shown, together with a wide range of general-purpose switches, fuse boxes, switch boxes, and junction boards. The lamps exhibited will include navigation lamps, cabin and cockpit lights, and a range of the well-known Rotax-Harley landing lamps.

W. S. SHACKLETON, LTD.—The wide interests of this firm of consultants and agents will be indicated by a number of exhibits. These will include the new Oddie spring cowling fastener and Oddie lock-nut, for which Shackletons have been commissioned to sell the Continental manufacturing rights; Everel single-blade airscrews; and a 37 mm. shell-gun made by the American Armament Corporation and shown in conjunction with Sterling Electric Holdings, Ltd., who have purchased it. It is also hoped to provide particulars on behalf of aircraft manufacturers not otherwise represented.

SHORT AND MASON, LTD.—Aircraft and meteorological instruments of the type in which this firm specialises will be displayed. Aircraft instruments, including compasses, will be shown on display panels, there will be laboratory test apparatus, and the meteorological instruments will include a micro-barograph, wind velocity indicator and wind direction indicator.

SMITH'S AIRCRAFT INSTRUMENTS.—On the stand of this famous firm of instrument-makers the outstanding exhibit will be a panel for a twin-engined aircraft; it will display a blind-flying group, boost gauge, revolution indicators and oil and fuel gauges, together with a repeat group of flying instruments for the co-pilot. Other Smith's equipment on the panel will include oxygen regulators, undercarriage and flap indicators, vacuum and pressure gauges for gyroscopic instruments and automatic pilot; landing light and flare switches; and warning lights for oil and fuel gauges.

VOKES, LTD., will exhibit a panel-type air filter, as incorporated in the cowling of liquid-cooled engines for the filtration of air to the carburettor intake, together with their three-ply external type as used on air-cooled or radial engines, and which can be fitted to existing machines without slowing up production or causing any serious alteration. Other items will include lubricating-oil filters for use in hydraulic systems, and oil filters for aircraft engines and test-bed work; air straighteners for removing eddies and cross-currents in aircraft intakes; and lightweight engine exhaust silencers for in-line and radial engines.